M/035/0002
cc: Leslie

Rio Tinto

Piper Rhodes
Principal Advisor – Community Affairs
4700 Daybreak Parkway
South Jordan, UT 84095
801-204-2780

July 27, 2012

Mr. & Mrs. Crane
35 West Shaggy Mountain Rd
Herriman, UT 84096

Dear Mr. & Mrs. Crane:

Thank you for contacting Kennecott Utah Copper to voice your concerns about blasting operations at the Bingham Canyon Mine. Earth Dynamics has now completed its report regarding the physical inspection of your home at 35 Shaggy Mountain Road in Herriman and the vibration monitoring at your home that was conducted from June 27, 2012, to July 14, 2012. I have enclosed a copy of the report for your files.

As set forth in more detail in the report, we believe that any property damage to your home, that may have occurred on June 14, 2012, is not the result of blasting at the Bingham Canyon Mine. We hope that you find the information contained in the report to be helpful.

Again, I appreciate you contacting us regarding your concerns. If you would like to discuss the report, please feel free to contact me directly at 801-204-2780.

Sincerely,

Piper Rhodes

Piper Rhodes

Enclosure
Cc: Leslie Helper, Utah Division of Oil, Gas & Mining

Report on

Structural Inspection and Vibration Monitoring at 35 Shaggy Mountain Road Herriman, UT

RECEIVED
JUL 3 1 2012
DIV. OF OIL, GAS & MINING

July 25, 2012

Prepared for:

Rio Tinto
4700 Daybreak Parkway
South Jordan, UT 84095

Prepared by:

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1.0 INTRODUCTION

At the request of Jennifer Sekulski-Barton of Rio Tinto, Earth Dynamics conducted an inspection and monitored ground vibrations at the residence located at 35 Shaggy Mountain Road, Herriman, Utah. The residence is owned and occupied by Randy and Jean Crane. The subject property is located approximately three miles southeast of the southeastern edge of the Bingham Canyon Mine. A vicinity map is shown in Figure 1-1.

The inspection and installation of a seismograph was completed on June 27, 2012 by Dr. Michael Feves of Earth Dynamics. The homeowners and Ms. Sekulski-Barton were present during the inspection and seismograph installation. Ground vibrations were continuously monitored from June 27, 2012 through July 14, 2012. The purpose of this investigation is to help determine if blasting activities at the Bingham Canyon Mine are related to development of a drywall crack in the subject property. The homeowners reported that on June 14, 2012, they noticed that a crack had developed in a wall adjacent to a stairway at the southern end of the den area in their home. They believe that the crack appeared after they heard a loud noise and felt the house shake on June 14th.

This report contains a summary of the inspection, a brief tutorial on ground vibration, describes applicable vibration criteria, summarizes the measured ground vibration data, and discusses the data analyzed and possible causes for the described drywall crack.

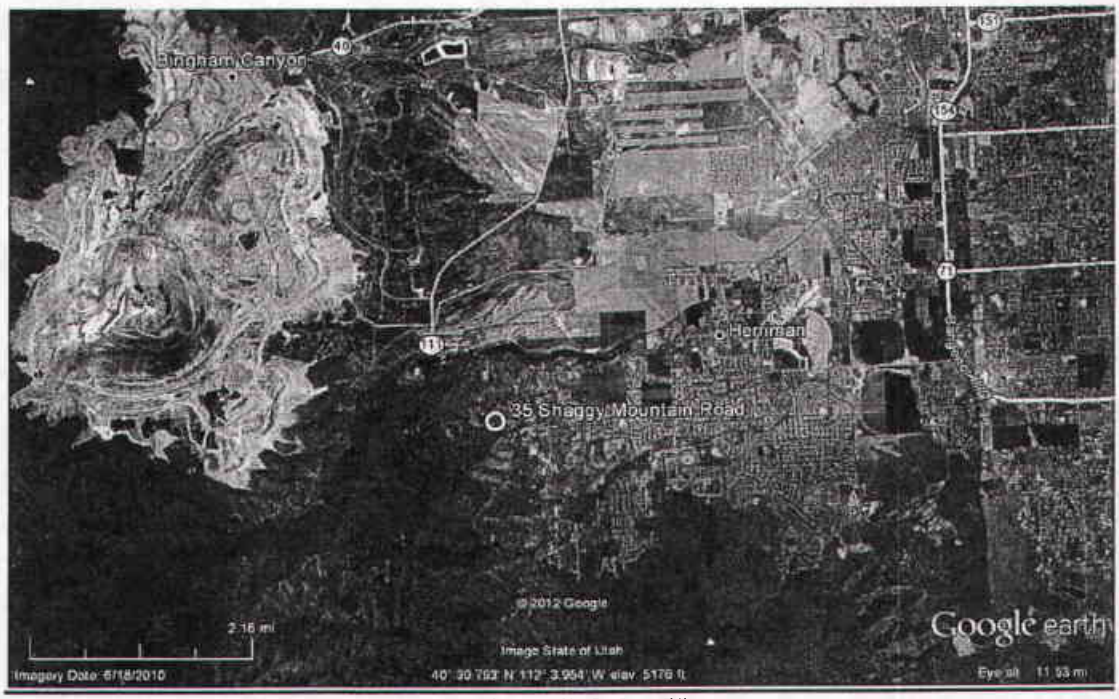

Figure 1-1. Vicinity Map.

2.0 VIBRATION FUNDAMENTALS

When the ground is subjected to vibratory excitation, a disturbance propagates away from the excitation source. The disturbance consists primarily of three types of seismic waves: compression or primary waves (P-waves), secondary or shear waves (S-waves) and surface or Rayleigh waves (R-waves). The particle motion associated with a P-wave is a push-pull motion parallel to the direction of the wave front. The particle motion associated with S-waves is perpendicular to the direction of the wave front. Particle motion of R-waves is retrograde elliptical in planes normal to the surface and parallel to the direction of propagation. R-waves are confined to a zone near the ground surface that is approximately one wavelength deep.

Vibration amplitude decreases with distance. For perfectly elastic material the amplitudes of P- and S-waves along a free surface decay in direct proportion to the square of the distance from the source due to geometrical spreading of the seismic energy. The amplitude of R-waves decreases in direct proportion to the square root of the distance from the source. Since R-waves decay more slowly than P- and S- waves, and R-waves contain most of the seismic energy, R-waves are the most significant disturbance along the ground surface (Richart, 1970). R-waves are of primary concern in most blasting and construction environments because seismic sources and receivers that are typically associated with these activities are located at or near the ground surface.

In addition to geometrical spreading, the amplitude of seismic waves is attenuated by internal friction in earth materials. Internal friction consists of sliding of soil and sand particles, deformation of rocks, and fluid motion in pores as seismic waves travel through the ground. Many factors affect material damping in the ground, including soil type, moisture content, temperature, and the frequency of the vibration source(s). More damping is typically observed in clays than in sandy soils. Wiss (1967) proposed an attenuation equation that includes seismic damping from both geometrical spreading and internal friction. Equation 2-1 is Wiss's attenuation relation.

$$V = kD^{-n} \qquad Equation\ 2-1$$

where:
V = peak particle velocity (PPV) of the seismic wave
k = value of velocity at one unit of distance
D = distance from the vibration source
n = slope or attenuation rate

The "n" value in Equation 2-1 is a pseudo-attenuation coefficient that accounts for both geometric spreading and material damping. Woods and Jedele (1985) developed values for "n" from construction data. For hard soils such as dense

compacted sand, dry consolidated clay, and consolidated glacial till rock that requires a pick to excavate, Woods and Jedele determined that an n-value of 1.1 is appropriate. For softer material such as sandy or silty clay, gravel, silt and weathered rock, n = 1.5.

In Equation 2-1, motion is described in terms of peak particle velocity (PPV). Vibration in the ground or in structures is typically expressed in terms of particle motion. Particle motion can be described in terms of displacement (D), velocity (V) or acceleration (A). For simple harmonic motion these three terms are related by Equation 2-2.

$$A = 2\pi fV = (2\pi f)^2 * D \qquad Equation\ 2-2$$

Particle velocity is typically used to describe vibrations in mining and construction environments because most blasting seismographs use velocity transducers, and most vibration criteria are specified in terms of particle velocity. PPV is generally accepted as the most appropriate descriptor for evaluating building damage potential. However, for human response, average vibration amplitude is more appropriate because it takes time for the human body to respond to induced vibration. Root-mean-square (RMS) amplitude is typically used to assess human response to vibration. RMS values are always less than peak values. The ratio of peak value to RMS value is termed the "crest factor". Crest factor depends upon the frequency characteristics of the vibration. For pure tone sine waves, the crest factor is 1.414. For random ground vibration such as from trains and vehicle traffic, the crest factor is 4. For vibration from blasting and other impulse sources, the crest factor cannot be readily defined because it depends upon the averaging time of the RMS measurement. Crest factors of 8 or more are not uncommon for impulsive noise sources such as pile driving (FTA 2006).

When discussing vibration amplitude, the direction of the particle motion must be considered. Vibration amplitude is typically measured and described in terms of three orthogonal directions: vertical (V), horizontal transverse to the vibration source (T), and horizontal longitudinally toward the source (L). The total vibration can be described in terms of the vector sum of the three orthogonal components. The vector sum is defined in Equation 2-3. For most vibration studies, component PPV rather than vector sum values are used because most vibration criteria are expressed as component PPV.

$$Vector\ Sum = \sqrt{V^2 + T^2 + L^2} \qquad Equation\ 2-3$$

Prediction of PPV from blasting is often related to "scaled distance". Scaled distance is a parameter that accounts for the distance from the blast (D) and the maximum weight (W) of explosive that is detonated within an eight millisecond period (maximum weight per delay). Scaled distance is commonly expressed as the ratio of D to the square root of W ($D/W^{1/2}$).

3.0 VIBRATION STANDARDS AND CRITERIA

3.1 Human Response

The effects of vibrations on people have been studied for many years. Reiher and Meister (1931) completed one of the earliest studies on human response to vibration. The results of Reiher and Meister (1931) are summarized in Table 3-1. The data in Table 3-1 were acquired under steady-state conditions when the people were expecting the vibration. A later study by Wiss and Parmelee (1974) investigated the effects of transient vibrations on people. Transient effects are summarized in Table 3-2. Comparison of Table 3-1 to Table 3-2 suggests that thresholds for perception and annoyance are higher for transient vibration than for continuous vibration.

Table 3-1. Human Response to Steady State Vibration. (Reiher and Meister, 1931)

PPV (ips)	Human Response
3.6 (at 2 Hz) – 0.4 (at 20 Hz)	Very disturbing
0.7 (at 2 Hz) – 0.17 (at 20 Hz)	Disturbing
0.10	Strongly perceptible
0.035	Distinctly perceptible
0.012	Slightly perceptible

Table 3-2. Human Response to Transient Vibration. (Wiss and Parmelee, 1974)

PPV (ips)	Human Response
2.0	Severe
0.9	Strongly perceptible
0.24	Distinctly perceptible
0.035	Barely perceptible

3.2 Structural Response

The effect of vibration on structures has been the subject of extensive research. Much of the research originated in the mining industry where vibration from blasting is a critical issue. The U.S. Bureau of Mines (USBM) Report of Investigations #8507 (Siskind et al. 1980) computed structural damage probabilities due to ground vibration. The USBM report includes data from nine quarry blasting studies by other agencies, and USBM data from 240 quarry blasts at seventy-six homes in six states. A summary of the USBM results is shown in Table 3-3 and Figure 3-1.

The main conclusions of USBM RI 8507 are that safe vibration levels are dependent upon the frequency of the vibration, and that no damage was observed at vibration levels below 0.5 inches per second (ips) for lath and plaster construction or less than 0.75 ips for modern drywall construction. The USBM vibration criteria are shown in Figure 3-2. The 0.5/0.75 ips criterion is supported by the observation that human activities such as walking and closing doors produce strains in a residence which are equivalent to ground vibrations of 0.5 ips. Stagg et al. (1984) determined that environmental effects such as wind gusts and changes in temperature or humidity can cause internal strains in a residence which are equivalent to ground motion up to 1.2 ips. There are three cases where the 0.5/0.75 ips criterion is not sufficient: 1) Areas where vibration sensitive activities or instruments are present, such as micro-electronics fabrication; 2) vibrations with frequencies below four Hertz (Hz) such as vibrations produced by earthquakes and large underground explosions; and 3) situations where resonance conditions exist.

Table 3-3. USBM Vibration Damage Probability.

Damage Type	PPV (ips)			
	5% probability	10% probability	50% probability	90% probability
Threshold damage: loosening of paint, small plaster cracks at joints between construction elements	0.5	0.7	2.5	9.0
Minor damage: loosening and falling plaster, cracks in masonry around openings near partitions, hairline to 3-mm (0-1/8-in.) cracks, fall of loose mortar	1.8	2.2	5.0	16.0
Major damage: cracks of several mm in walls, rupture of opening vaults, structural weakening, fall of masonry, load support ability affected	2.5	3.0	6.0	17.0

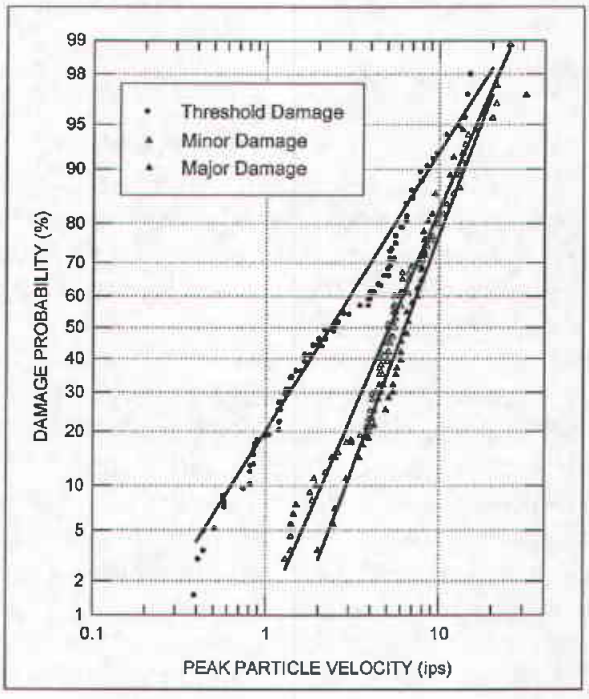

Figure 3-1. Damage Probability Analysis (Siskind et al. 1980).

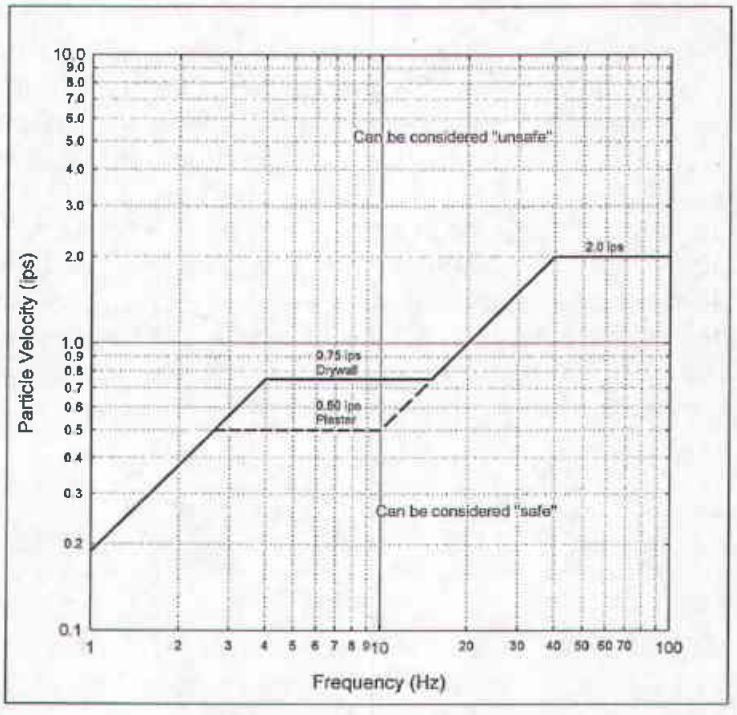

Figure 3-2. USBM Damage Criteria.

4.0 INSPECTION OBSERVATIONS

The homeowners, Randy and Jean Crane, were present during the inspection. The inspection consisted of examination and photographic documentation of all readily accessible areas of the interior and exterior of the home. Approximately eighty photographs were taken during the inspection. The homeowner reported that the structure was built in 1994. The Cranes purchased the home in 1996 and have lived there ever since.

The subject property is a two-story wood frame house that contains a daylight basement and an attached two car garage. The living area is approximately 3,000 square feet. The foundation of the structure appears to be concrete strip footings around the perimeter and a slab on grade in the garage. Most of the interior wall surfaces are smooth wall drywall, and the ceilings are textured drywall. The exterior is finished with brick veneer wainscot and acrylic stucco.

Several cracks and other damage that are considered normal for a home of this age were observed during the inspection. The homeowners reported that most of the cracks and other damage were present when they moved in. Some water damage was noted at the exterior of the chimney that the homeowner was not aware of.

Photographs of the crack that the homeowners noticed on June 14, 2012 are shown in Figures 4-1 through 4-3. The crack extends vertically from the ceiling to a point that is approximately four feet below the ceiling. The homeowner marked the bottom end of the crack with blue tape prior to the inspection. The crack is generally wedge-shaped with some irregularities. It is less than 0.04 inches wide at the top and narrows to a point at the end where the blue tape is located. The end of the crack did not appear to extend beyond the blue tape. The edges of the crack are sharp, and no dirt or debris was noted in the crack. These observations are consistent with the homeowner's observation that this is a recently formed crack. Photographs of other cracks and defects will be maintained on file at our Portland, OR office for at least five years.

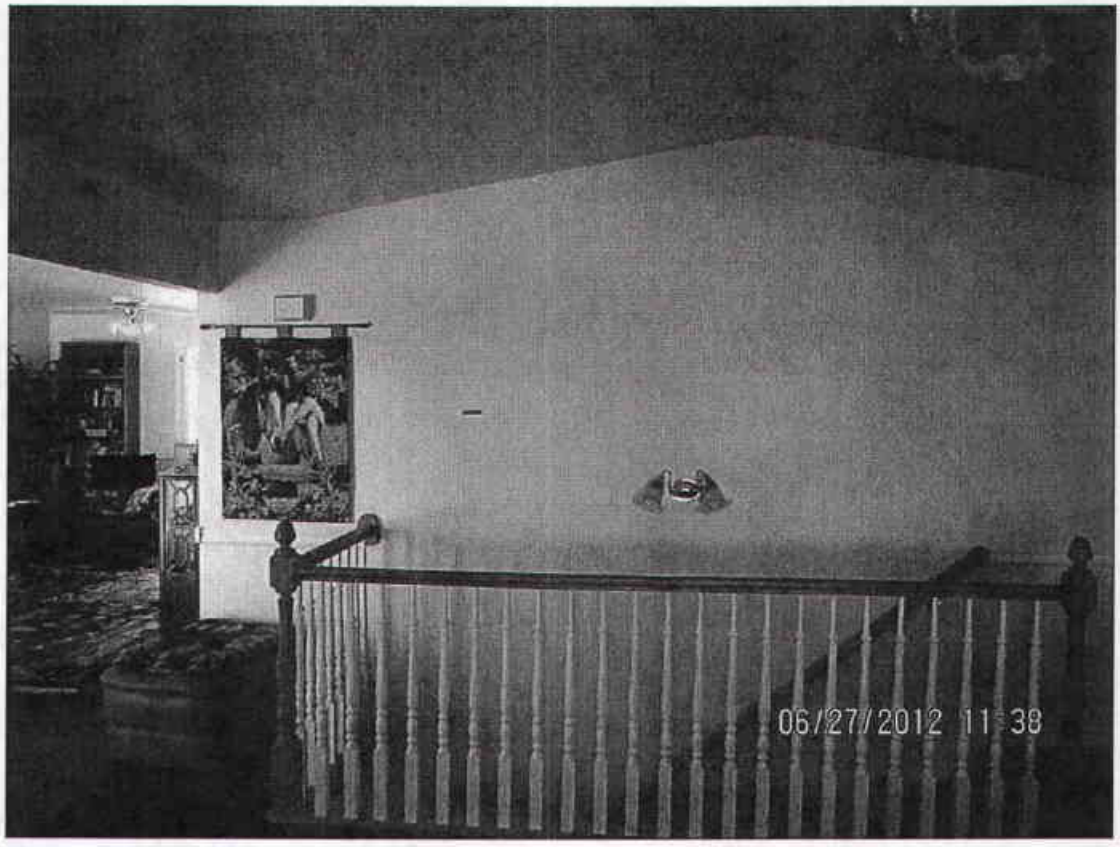

Figure 4-1. Overview of south wall in den area. Blue tape marks the bottom of crack that was first observed on 6/14/12.

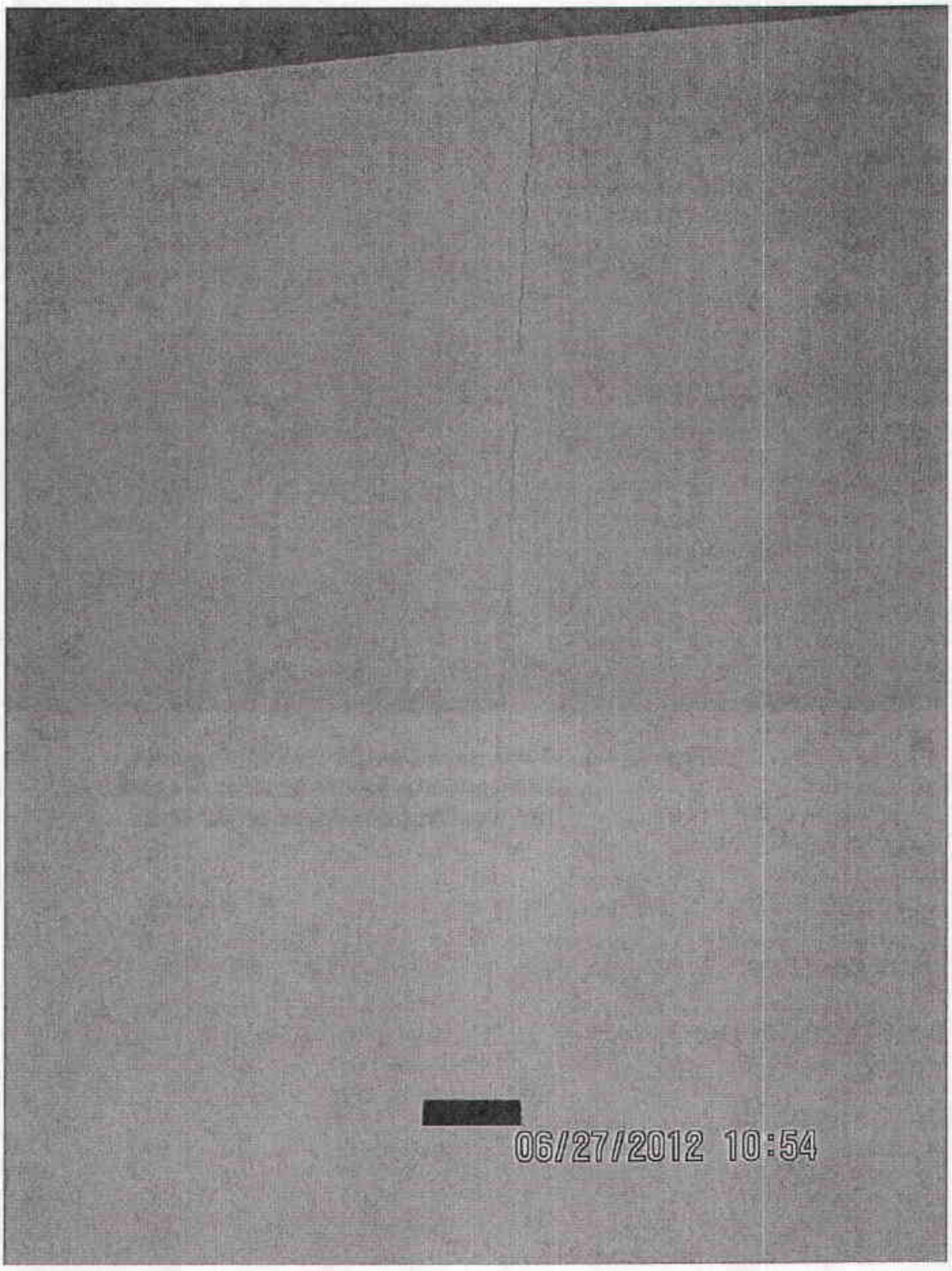

Figure 4-2. Crack that was first observed on 6/14/12.

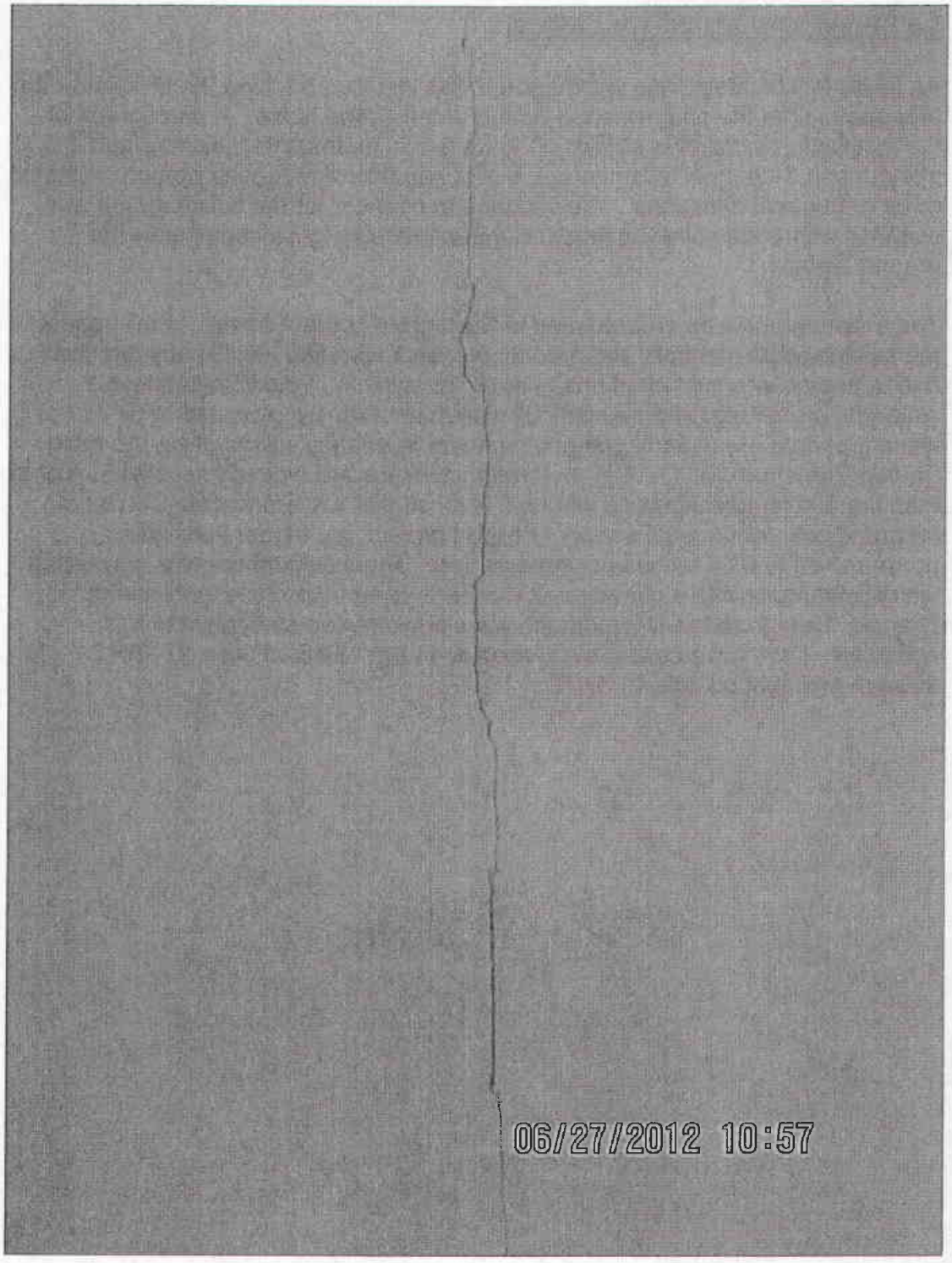

Figure 4-3. Close-up view of the middle portion of the crack that was observed on 6/14/12.

5.0 SEISMOGRAPH INSTALLATION

An Instantel MiniMate Plus seismograph was installed on June 27, 2012 near the propane tank at the southwestern corner of the Crane home. A photograph of the installation location is shown in Figure 5-1. The Instantel seismograph is a stand-alone 3-channel seismograph that is capable of recording ground motion in three orthogonal directions. The vibration transducer for the seismograph was installed with three spikes in firm soil approximately eight inches below the ground surface.

The seismograph was programmed in "histogram-combo" mode. In this mode, the seismograph monitors and records the peak vibration level in any direction over a preset time interval of one minute. In addition, if the vibration levels exceed a preset trigger threshold, full waveform data are recorded. Full waveform data are used to compute spectral frequency values using the Fast Fourier Transform (FFT). Trigger threshold values are typically set slightly higher than the ambient background vibration level so that waveform data would be recorded only for unusual activity. For this project, the trigger level was programmed to 0.04 inches per second (ips). The seismograph was connected via cellular modem to a computer at the Earth Dynamics office in Portland, Oregon. Data from the seismograph were downloaded each night to this computer. Data were continuously recorded from 13:46 on June 27, 2012 through midnight on July 14, 2012.

Figure 5-1. Overview of seismograph installation.

6.0 VIBRATION MONITORING RESULTS

Measured vibration data are summarized in Appendix A. Vibrations at the site are generally less than 0.01 ips. Two waveform events were recorded during this monitoring period. These events occurred on June 30 at 07:13 and July 1 at 17:34. The waveform data indicate that both of these events are the result of electrical noise, possibly static discharge, and not ground vibrations. On July 10, 2012, the gains on the seismograph amplifiers were increased by a factor of eight and the trigger level was reduced to 0.025 ips. After increasing the gains, vibration levels ranging from 0.003 to 0.006 ips were measured. The maximum vibration that was measured after increasing the gains is 0.007 ips. This reading was recorded at 12:49 on July 14, 2012.

7.0 DISCUSSION

During the seismic monitoring period twenty-seven shots were detonated at the Bingham Canyon Mine. Details for these shots are summarized in Table 7-1 along with data from the three shots that were detonated on June 14, 2012.

Examination of the data in Table 7-1 indicates that the shots on June 14th were much smaller than the shots that are typically detonated at the Bingham Canyon Mine. None of the shots listed in Table 7-1 produced vibrations that were greater than the ambient vibration levels measured by the seismograph at the Crane residence. This observation is consistent with predicted vibration levels versus distance from the shots.

Vibrations from blasting are typically predicted using scaled distance relations as described in the Blasters' Handbook (ISEE, 1998) or in the National Fire Protection Association Explosive Materials Code (NFPA, 2010). Equation 7-1 describes the scaled distance (SD) relation that is most commonly used.

$$SD = \frac{D}{\sqrt{W}} \qquad Equation\ 7-1$$

where: SD = scaled distance ($ft/lb^{1/2}$)
D = distance from the shot to the receiver (ft)
W = the weight of explosive detonated within an eight millisecond period (lb).

Siskind (2000) summarizes propagation equations for a variety of blasting conditions. Siskind predicts PPV in ips from typical quarry blasting using Equation 7-2 below:

$$V = 182(SD)^{-1.82} \qquad Equation\ 7-2$$

Note that equation 7-2 has the same form as Equation 2-1, with distance replaced by scaled distance (Equation 7-1). The data in Table 7-1 indicate that during the monitoring period, the maximum explosive weight per delay was 1,750 lb. Assuming that all shots are located at least 16,000 feet from the Crane residence, Equation 7-2 predicts that blasting at the Bingham Canyon Mine produces vibrations of less than 0.0036 ips. This value is two hundred times less than the USBM value for threshold damage to dry wall construction. Therefore, it is not possible that the June 14th crack was due to ground vibrations produced by blasting at the Bingham Canyon Mine.

The Cranes reported hearing a loud noise that was coincidental with shaking of their home. Blasting typically produces an atmospheric pressure wave. This wave is commonly termed air overpressure. Air overpressure waves can cause structural vibrations. The largest air overpressure induced vibrations are typically observed perpendicular to planar surfaces such as windows and walls. This mode of vibration is termed "midwall" vibration. Siskind (2000) summarizes midwall response to air overpressure based on five studies by the USBM. Siskind's summary is contained in Figure 7-1.

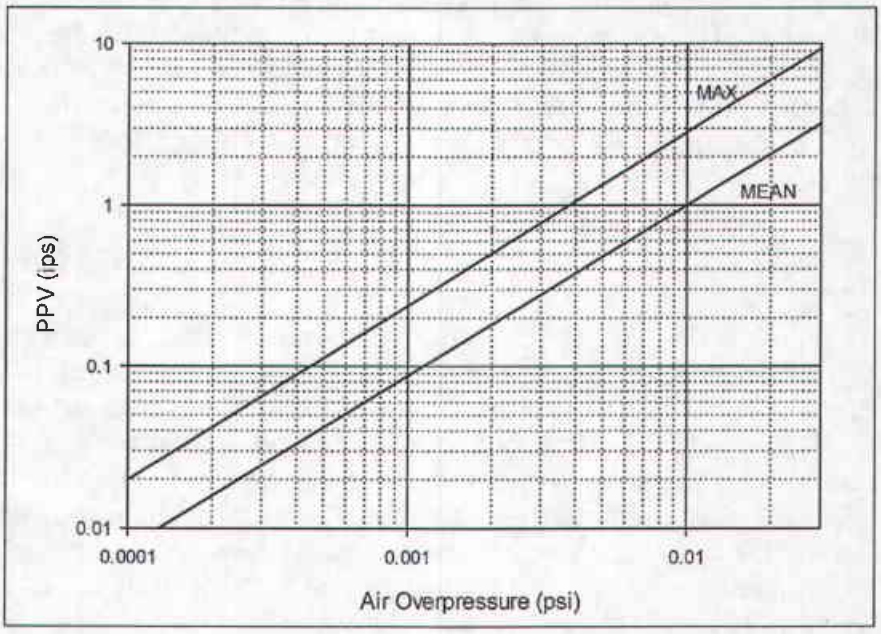

Figure 7-1. Midwall Response to Air Overpressure. (Siskind, 2000)

Measurements of air overpressure were not included in this study. However, air overpressure can be estimated using established relations for air overpressure attenuation. Air overpressure is a function of distance, weight of explosive per delay, confinement of the blast, atmospheric conditions and topography. For typical quarry highwall blasting similar to designs at the Bingham Canyon Mine, air overpressure (AO) in pounds per square inch (psi) is given by Equation 7-3. (Siskind, 2000)

$$AO = 0.162\left(\frac{D}{\sqrt[3]{W}}\right)^{-0.794} \qquad Equation\ 7-3$$

Note that Equation 7-3 has the same form as Equation 7-2, except that scaled distance is replaced by cube-root scaled distance. With a distance of 16,000 feet and an explosive weight of 1,750 lb, Equation 7-3 predicts that air overpressure at the Crane residence is 5.4 x 10^{-4} psi. The data in Figure 7-1 indicate that an air overpressure value of 5.4 x 10^{-4} psi produces midwall responses that range from 0.04 to 0.11ips. This range in midwall vibration is well below the USBM damage threshold value of 0.75 ips. Therefore, it is unlikely that blasting at the Bingham Canyon Mine produced air overpressures that were sufficient to cause the June 14th crack.

An email from Sgt. Alex de Montigny to Piper Rhodes of Rio Tinto dated June 15, 2012 indicates that the U.S. Army conducted demolition training between 10:25 AM and 1:36 PM on June 14th. The training occurred near the northern boundary of Camp Williams. This boundary is approximately two miles from the Crane residence. Explosives that are detonated in air produce air overpressures that are considerably greater than overpressures produced by confined mining detonations. Equation 7-4 describes propagation of air overpressure from unconfined explosions.

$$AO = 187\left(\frac{D}{\sqrt[3]{W}}\right)^{-1.38} \qquad Equation\ 7-4$$

The weight of explosives that the U.S. Army used on June 14th is not known so it is not possible to compute the air overpressure at the Crane residence that was produced by the demolition exercises. However, Equation 7-4 indicates that detonation of thirty to forty pounds of unconfined explosives at a distance of 10,000 ft is sufficient to cause air overpressures on the order of 3×10^{-3} psi. The data in Figure 7-1 indicate that air overpressure of this magnitude may produce midwall vibrations of up to 0.75 ips. This calculation does not account for atmospheric or other environmental conditions that may affect air overpressure propagation, or structural stiffness considerations. Further, window cracking is typically the first indication of air overpressure damage. No window damage was noted at the Crane residence (or any other property in the vicinity of the Crane residence).

In summary, blasting activities at the Bingham Mine do not produce sufficient ground vibration or air overpressure to cause the reported damage to the Crane residence. There are several residential structures that are closer to Camp Williams and to the Bingham Mine than the Crane residence. If ground vibrations or air overpressure produced damage at the Crane residence, then it is likely that damage also occurred at these closer structures. No damage has been reported from other homeowners.

Table 7-1. Summary of Blasting Data at the Bingham Canyon Mine.

Date	Time	Location		No. of Holes	Total Explosive Weight (lbs)	Maximum Weight per Delay (lbs)
		SP E	SP N			
6/14/12	10:30 AM	1,821,734.95	801,722.78	170	62,000	450
6/14/12	2:30 PM	1,821,082.36	791,396.64	50	21,000	475
6/14/12	4:00 PM	1,823,346.95	792,788.39	24	7,200	300
6/28/12	11:00 AM	1,819,969.32	800,910.23	150	115,500	1,350
6/28/12	4:30 PM	1,821,786.34	798,902.96	236	87,300	600
6/29/12	1:00 PM	1,821,700.83	792,122.40	174	201,000	1,700
6/29/12	3:25 PM	1,817,796.19	791,748.45	40	47,000	1.500
6/30/12	10:00 AM	1,823,088.92	800,434.37	85	75,000	1,300
6/30/12	11:30 AM	1,821,597.57	799,235.45	15	5.050	500
6/30/12	2:30PM	1,820,286.73	800,751.22	45	52,000	1,300
7/1/12	3:00 PM	1,816,447.37	792,111.06	200	260,000	1,750
7/3/12	1:00 PM	1,818,864.10	798,273.60	160	230,000	1,400
7/3/12	5:00 PM	1,822,314.90	801,500.17	125	56,300	500
7/4/12	10:00 AM?	1,822,010.29	798,019.47	44	31,000	850
7/4/12	4:30 PM?	1,818,049.47	791,597.72	175	75,000	600
7/5/12	1:20 PM	1,819,543.82	797,832.69	130	162,000	1,600
7/5/12	4:15 PM	1,821,355.40	799,321.19	60	78,000	1,350
7/6/12	5:10 PM	1,821,868.97	801,266.51	260	350,000	1,750
7/7/12	9:30 AM	1,820,732.85	800,386.09	62	67,000	1,300
7/7/12	3:35 PM	1,819,680.74	798,861.37	110	135,000	1,350
7/8/12	3:47 PM	1,820,902.02	791,853.46	230	300,900	1,700
7/9/12	5:10 PM	1,816,318.30	792,463.14	?	256,775	1,750
7/10/12	12:30 PM	1,819,722.03	798,738.60	60	60,000	1,500
7/10/12	4:30 PM	?	?	130	154,000	1,350
7/11/12	1:30 PM	1,819,581.84	798,028.57	160	187,900	1,550
7/12/12	4:15 PM	1,820,053.64	801,039.52	175	76,400	600
7/12/12	4:15 PM	1,820,912.21	800,147.94	102	90,650	1,450
7/13/12	11:00 AM	1,821,817.23	801,494.75	84	94,275	1,700
7/13/12	5:00 PM	1,822,865.02	800,909.97	215	85,275	550
7/14/12	2:48 PM	1,819,718.46	798,274.22	159	160,575	1,350

8.0 QUALIFICATIONS and LIMITATIONS

This analysis was completed by Dr. Michael Feves. Dr. Feves holds a B.S. degree in Physics from Reed College in Portland, OR, and a Ph.D. in geophysics from MIT in Cambridge, MA. He has over thirty years of experience analyzing vibration and acoustic issues. In the past five years Earth Dynamics has completed over eighty vibration related projects. Currently Earth Dynamics is an on-call contractor for noise and vibration issues for Tri-Met in Portland, Oregon, and for the Columbia River Crossing Project in Portland and Vancouver, Washington.

Some of the analysis contained in this report relies upon information provided by others. No independent verification of this information was included in the scope of work for this project. However, this project was designed to provide the most reliable information possible within the limitations of the methods. No warranty, express or implied, is made or intended by presentation of this work. Earth Dynamics accepts no responsibility for damages as a result of decisions made or actions taken based on this report.

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APPENDIX A

SEISMOGRAPH RECORDS

Instantel Earth Dynamics Vibration Report

EARTH DYNAMICS
2294 NW Thurman St
Portland, OR 97210
(503) 227-7656
www.earthdyn.com

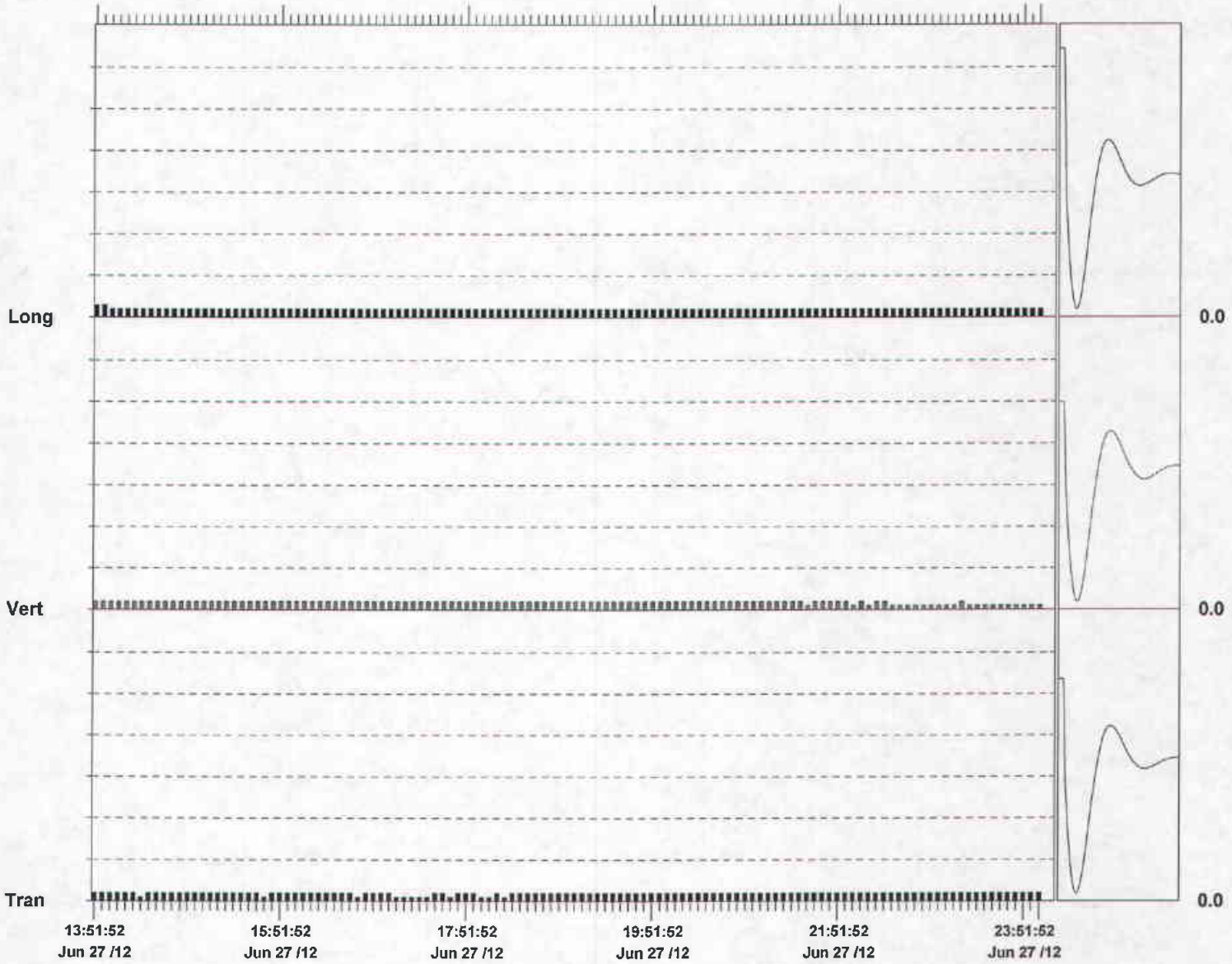
Histogram Start Time 13:46:52 June 27, 2012
Histogram Finish Time 00:00:01 June 28, 2012
Number of Intervals 614 at 1 minute
Range Geo:10.00 in/s
Sample Rate 1024sps
Job Number: 1210
Notes
Location: Kennecott - Loc 5
Client: Kennecott
User Name: M. Feves (Earth Dynamics)
General:

Serial Number BE12643 V 10.31-8.17 MiniMate Plus
Battery Level 6.7 Volts
Unit Calibration June 21, 2012 by Instantel
File Name N643ECFS.Y40H

Extended Notes
Transducer BT1664

	Tran	Vert	Long	
PPV	0.01000	0.01000	0.0150	in/s
ZC Freq	>100	>100	>100	Hz
Date	Jun 27 /12	Jun 27 /12	Jun 27 /12	
Time	13:48:52	13:47:52	13:51:52	
Sensor Check	Passed	Passed	Passed	
Frequency	7.4	7.5	7.9	Hz
Overswing Ratio	3.9	3.6	3.8	

Peak Vector Sum 0.0158 in/s on June 27, 2012 at 13:51:52



Time Scale: 5 minutes /div **Amplitude Scale:** Geo: 0.0500 in/s/div

Sensor Check

Instantel Earth Dynamics Vibration Report

EARTH DYNAMICS
2284 NW Thurman St
Portland, OR 97210
(503) 227-7659
www.earthdyn.com

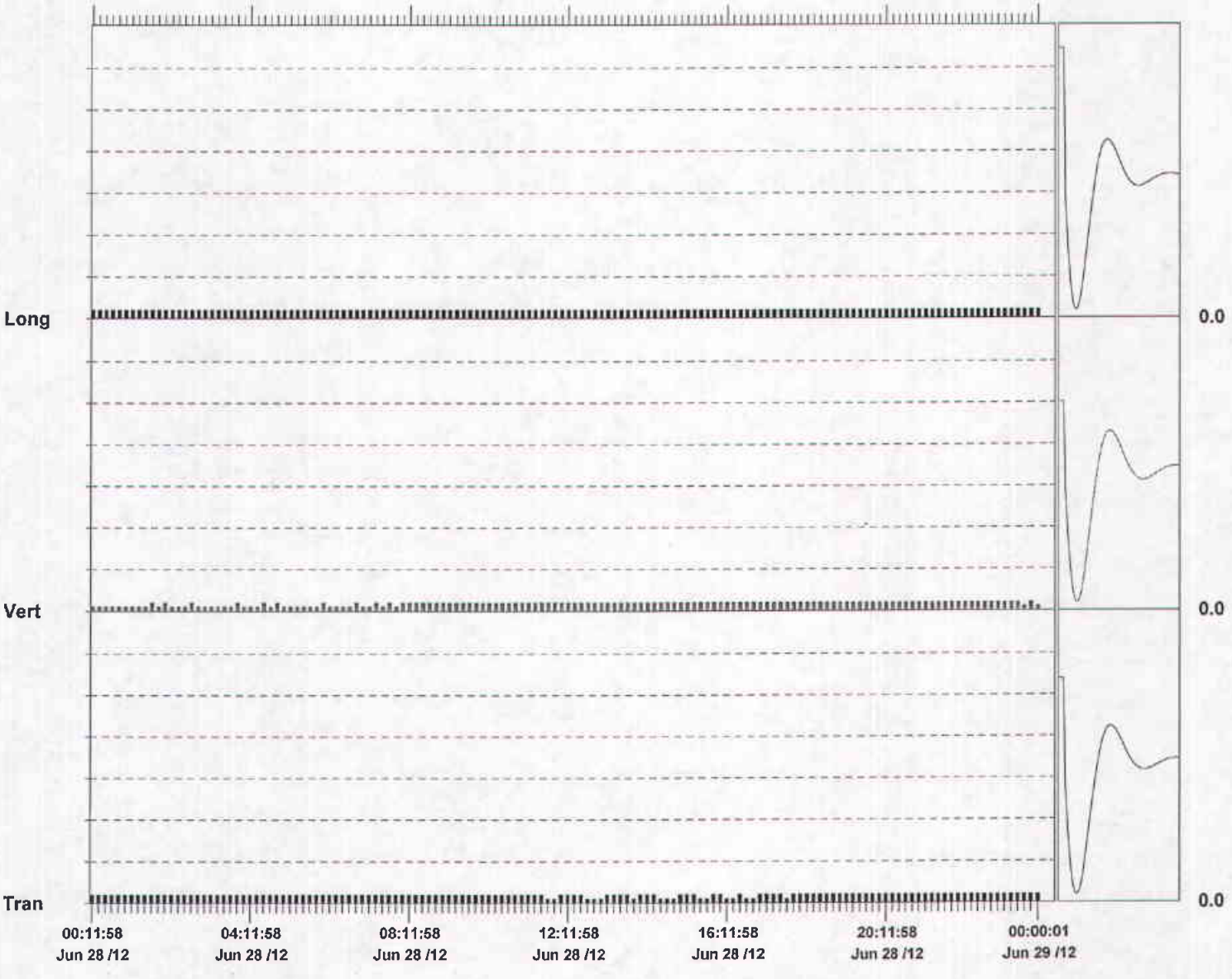
Histogram Start Time 00:01:58 June 28, 2012
Histogram Finish Time 00:00:01 June 29, 2012
Number of Intervals 1439 at 1 minute
Range Geo:10.00 in/s
Sample Rate 1024sps
Job Number: 1210
Notes
Location: Kennecott - Loc 5
Client: Kennecott
User Name: M. Feves (Earth Dynamics)
General:

Serial Number BE12643 V 10.31-8.17 MiniMate Plus
Battery Level 6.6 Volts
Unit Calibration June 21, 2012 by Instantel
File Name N643ECGL.FA0H

Extended Notes
Transducer BT1664

	Tran	Vert	Long	
PPV	0.01000	0.01000	0.01000	in/s
ZC Freq	>100	>100	>100	Hz
Date	Jun 28 /12	Jun 28 /12	Jun 28 /12	
Time	00:02:58	01:35:58	00:02:58	
Sensor Check	Passed	Passed	Passed	
Frequency	7.4	7.5	8.1	Hz
Overswing Ratio	3.9	3.6	3.8	

Peak Vector Sum 0.0141 in/s on June 28, 2012 at 09:16:58



Time Scale: 10 minutes /div **Amplitude Scale:** Geo: 0.0500 in/s/div

Sensor Check

Instantel

Earth Dynamics Vibration Report

EARTH DYNAMICS
2284 NW Thurman St
Portland, OR 97210
(503) 227-7659
www.earthdyn.com

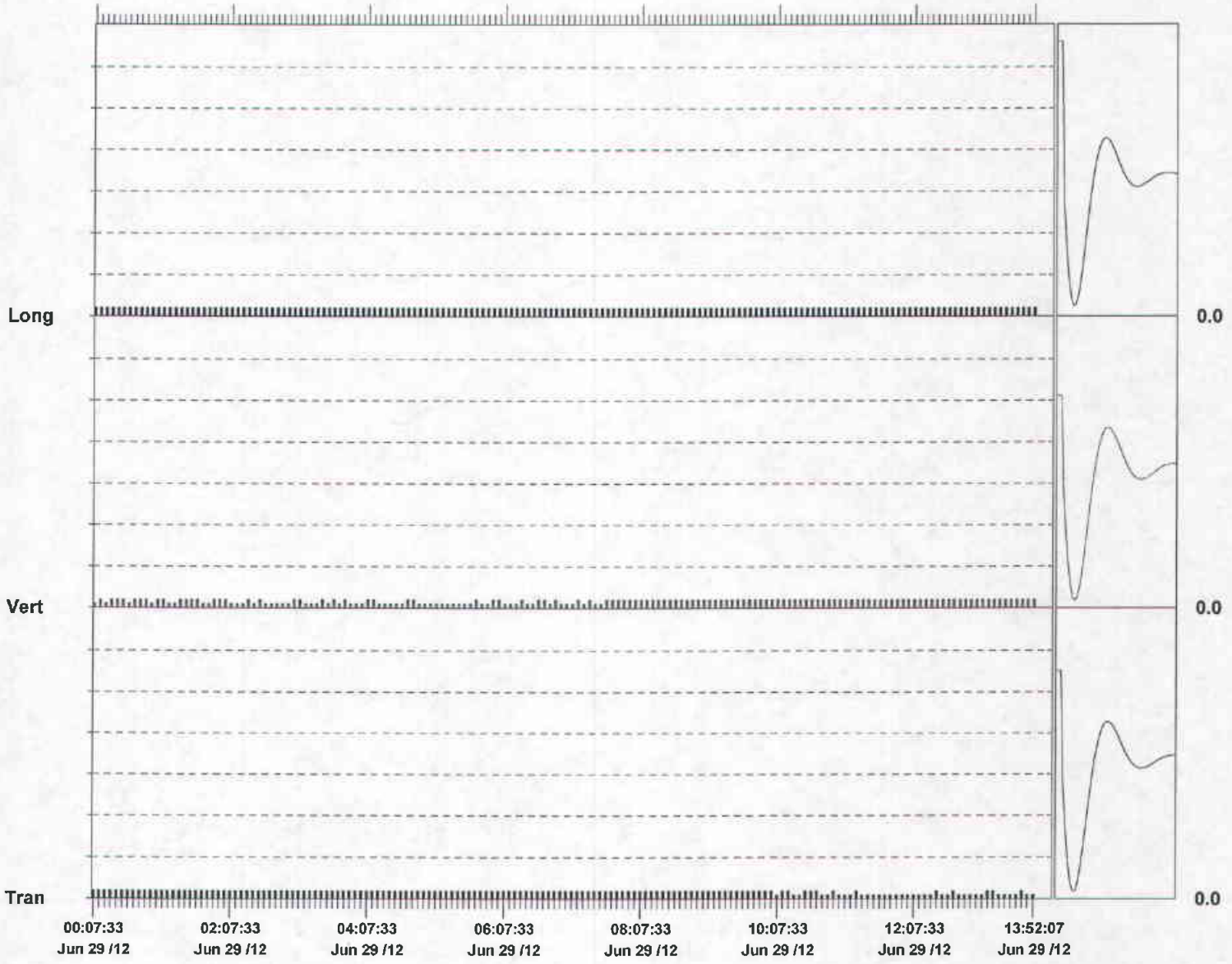
Histogram Start Time 00:02:33 June 29, 2012
Histogram Finish Time 13:52:07 June 29, 2012
Number of Intervals 829 at 1 minute
Range Geo:10.00 in/s
Sample Rate 1024sps
Job Number: 1210
Notes
Location: Kennecott - Loc 5
Client: Kennecott
User Name: M. Feves (Earth Dynamics)
General:

Serial Number BE12643 V 10.31-8.17 MiniMate Plus
Battery Level 6.5 Volts
Unit Calibration June 21, 2012 by Instantel
File Name N643ECIG.490H

Extended Notes
Transducer BT1664

	Tran	Vert	Long	
PPV	0.01000	0.01000	0.01000	in/s
ZC Freq	>100	>100	>100	Hz
Date	Jun 29 /12	Jun 29 /12	Jun 29 /12	
Time	00:03:33	00:12:33	00:03:33	
Sensor Check	Passed	Passed	Passed	
Frequency	7.5	7.5	8.1	Hz
Overswing Ratio	3.7	3.4	3.6	

Peak Vector Sum 0.0150 in/s on June 29, 2012 at 13:30:33



Time Scale: 5 minutes /div **Amplitude Scale:** Geo: 0.0500 in/s/div Sensor Check

Instantel

Earth Dynamics Vibration Report

EARTH DYNAMICS
2264 NW Thurman St
Portland, OR 97210
(503) 227-7656
www.earthdyn.com

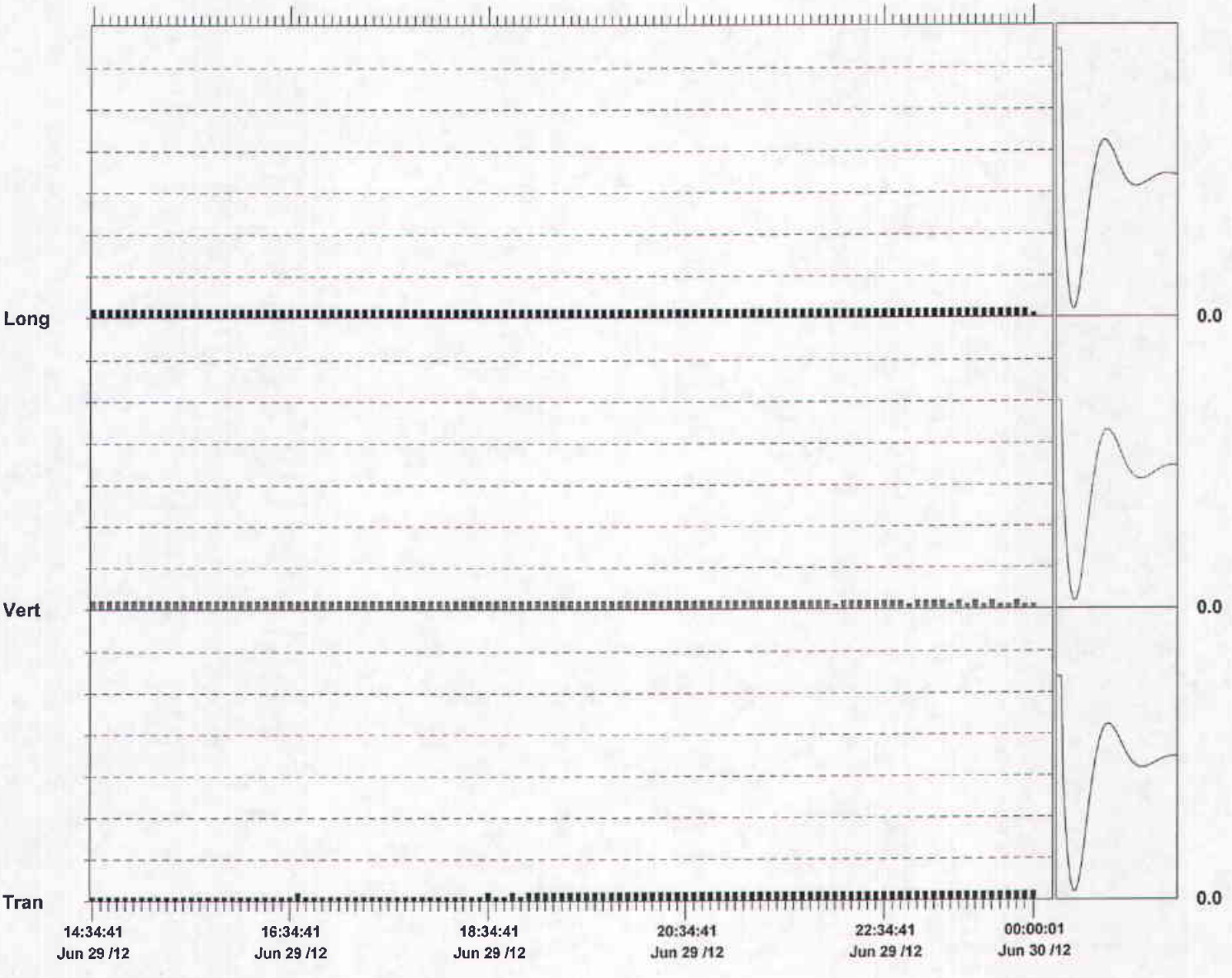
Histogram Start Time 14:29:41 June 29, 2012
Histogram Finish Time 00:00:01 June 30, 2012
Number of Intervals 571 at 1 minute
Range Geo:10.00 in/s
Sample Rate 1024sps
Job Number: 1210
Notes
Location: Kennecott - Loc 5
Client: Kennecott
User Name: M. Feves (Earth Dynamics)
General: 35 Shaggy Mountain Dr., Herriman, UT

Serial Number BE12643 V 10.31-8.17 MiniMate Plus
Battery Level 6.7 Volts
Unit Calibration June 21, 2012 by Instantel
File Name N643ECJK.9H0H

Extended Notes
Transducer BT1664

	Tran	Vert	Long	
PPV	0.01000	0.01000	0.01000	in/s
ZC Freq	>100	>100	>100	Hz
Date	Jun 29 /12	Jun 29 /12	Jun 29 /12	
Time	16:38:41	14:30:41	14:30:41	
Sensor Check	Passed	Passed	Passed	
Frequency	7.4	7.5	8.1	Hz
Overswing Ratio	3.9	3.6	3.8	

Peak Vector Sum 0.0150 in/s on June 29, 2012 at 14:31:41



Time Scale: 5 minutes /div **Amplitude Scale:** Geo: 0.0500 in/s/div

Sensor Check

Instantel Earth Dynamics Vibration Report

EARTH DYNAMICS
3294 NW Thurman St
Portland, OR 97210
(503) 227-7659
www.earthdyn.com

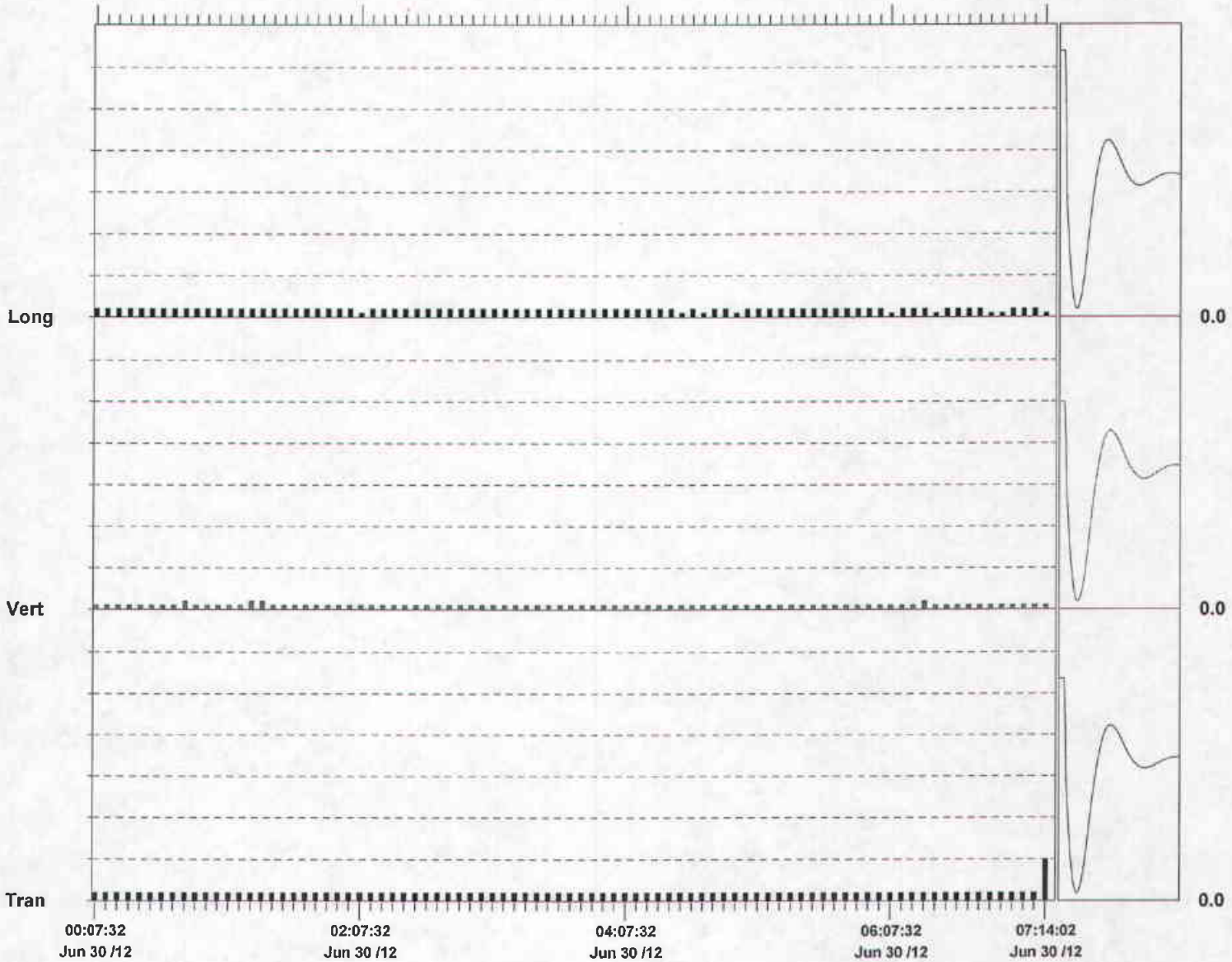
Histogram Start Time 00:02:32 June 30, 2012
Histogram Finish Time 07:14:02 June 30, 2012
Number of Intervals 432 at 1 minute
Range Geo:10.00 in/s
Sample Rate 1024sps
Job Number: 1210
Notes
Location: Kennecott - Loc 5
Client: Kennecott
User Name: M. Feves (Earth Dynamics)
General: 35 Shaggy Mountain Dr., Herriman, UT

Serial Number BE12643 V 10.31-8.17 MiniMate Plus
Battery Level 6.7 Volts
Unit Calibration June 21, 2012 by Instantel
File Name N643ECKA.S80H

Extended Notes
Transducer BT1664

	Tran	Vert	Long	
PPV	0.0500	0.01000	0.01000	in/s
ZC Freq	>100	>100	>100	Hz
Date	Jun 30 /12	Jun 30 /12	Jun 30 /12	
Time	07:14:02	00:45:32	00:03:32	
Sensor Check	Passed	Passed	Passed	
Frequency	7.4	7.5	7.9	Hz
Overswing Ratio	3.9	3.6	3.8	

Peak Vector Sum 0.0505 in/s on June 30, 2012 at 07:14:02



Time Scale: 5 minutes /div **Amplitude Scale:** Geo: 0.0500 in/s/div

Sensor Check

Instantel Earth Dynamics Vibration Report

EARTH DYNAMICS
2284 NW Thurman St
Portland, OR 97210
(503) 227-7059
www.earthdyn.com

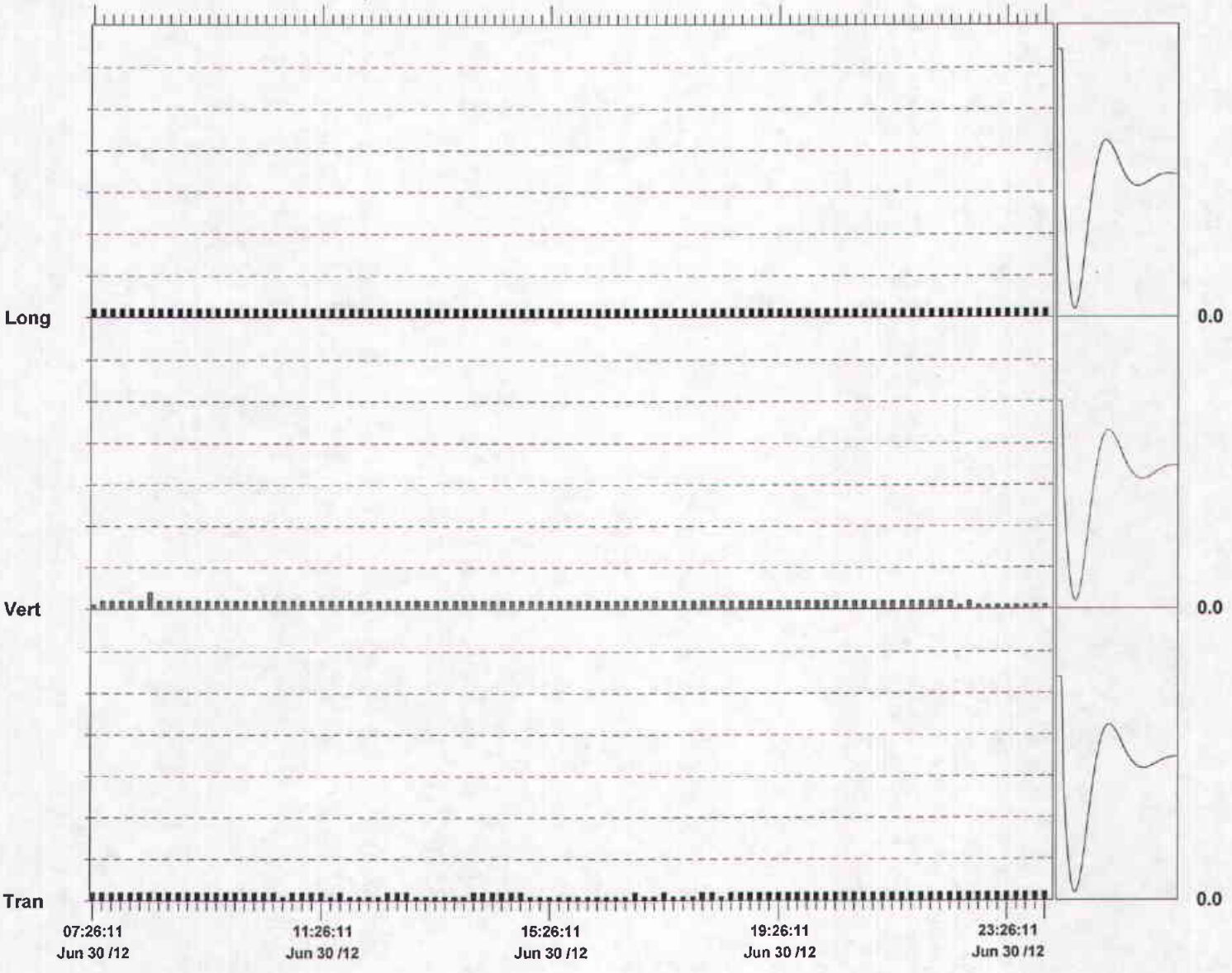
Histogram Start Time 07:16:11 June 30, 2012
Histogram Finish Time 00:00:01 July 1, 2012
Number of Intervals 1004 at 1 minute
Range Geo:10.00 in/s
Sample Rate 1024sps
Job Number: 1210
Notes
Location: Kennecott - Loc 5
Client: Kennecott
User Name: M. Feves (Earth Dynamics)
General: 35 Shaggy Mountain Dr., Herriman, UT

Serial Number BE12643 V 10.31-8.17 MiniMate Plus
Battery Level 6.6 Volts
Unit Calibration June 21, 2012 by Instantel
File Name N643ECKU.UZ0H

Extended Notes
Transducer BT1664

	Tran	Vert	Long	
PPV	0.01000	0.0200	0.01000	in/s
ZC Freq	>100	>100	>100	Hz
Date	Jun 30 /12	Jun 30 /12	Jun 30 /12	
Time	07:17:11	08:23:11	07:17:11	
Sensor Check	Passed	Passed	Passed	
Frequency	7.4	7.5	7.9	Hz
Overswing Ratio	3.9	3.6	3.8	

Peak Vector Sum 0.0212 in/s on June 30, 2012 at 08:23:11



Time Scale: 10 minutes /div **Amplitude Scale:** Geo: 0.0500 in/s/div

Sensor Check

Instantel Earth Dynamics Vibration Report

EARTH DYNAMICS
2284 NW Thurman St
Portland, OR 97210
(503) 227-7659
www.earthdyn.com

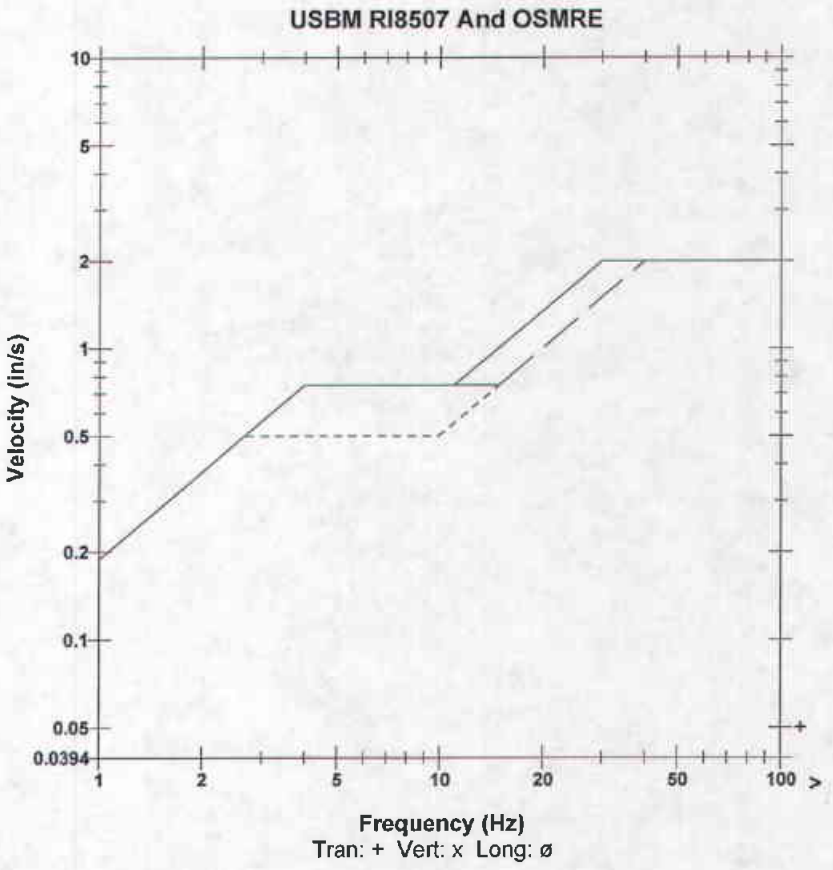
Date/Time	Tran at 07:13:47 June 30, 2012
Trigger Source	Geo: 0.0400 in/s
Range	Geo: 10.00 in/s
Record Time	15.0 sec at 1024 sps
Job Number:	1210
Notes	
Location:	Kennecott - Loc 5
Client:	Kennecott
User Name:	M. Feves (Earth Dynamics)
General:	35 Shaggy Mountain Dr., Herriman, UT

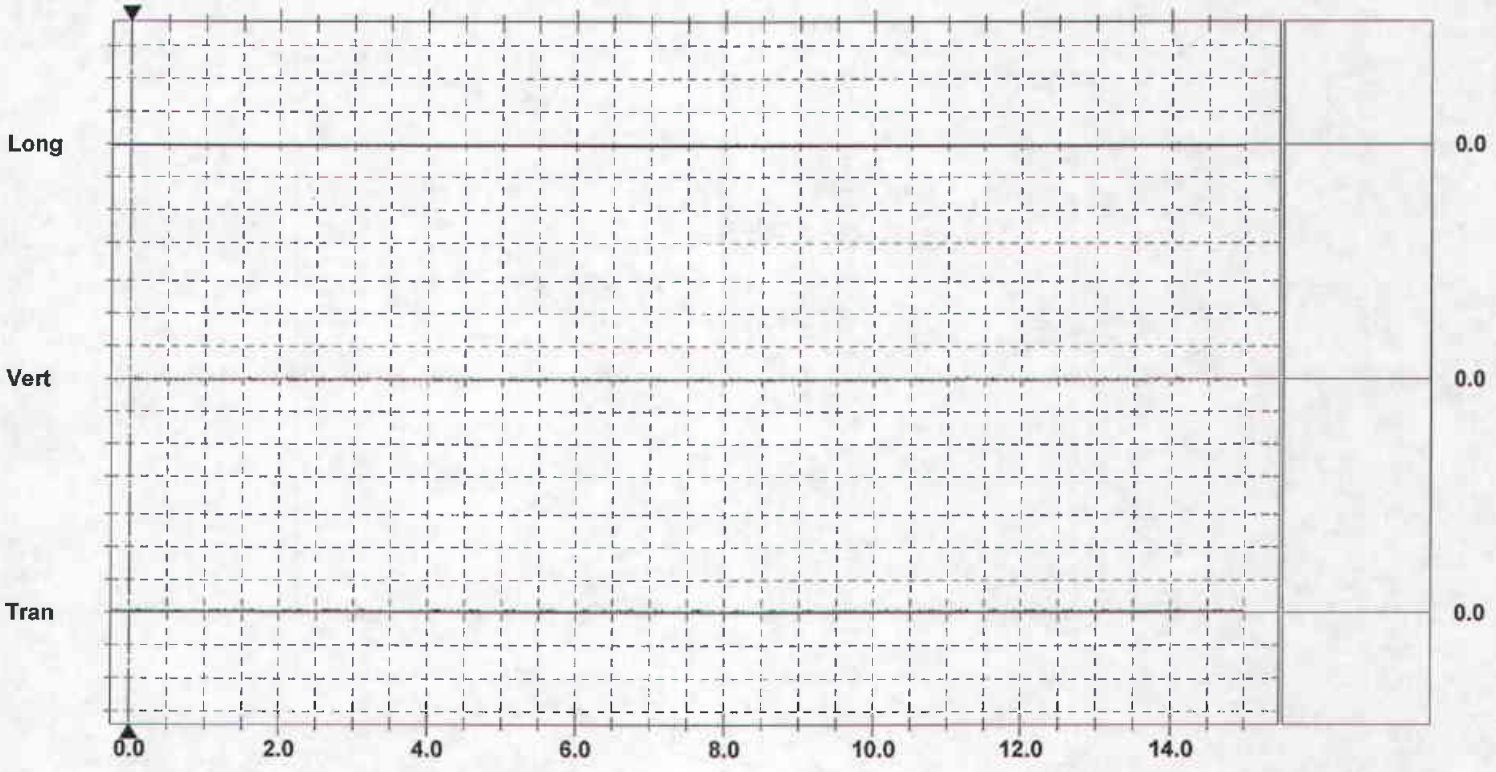
Extended Notes
Combo Mode June 30, 2012 00:02:31
Transducer BT1664

	Serial Number	BE12643 V 10.31-8.17 MiniMate Plus
	Battery Level	6.6 Volts
	Unit Calibration	June 21, 2012 by Instantel
	File Name	N643ECKU.QZ0W

	Tran	Vert	Long	
PPV	0.0500	0.00500	0.00500	in/s
ZC Freq	>100	>100	>100	Hz
Time (Rel. to Trig)	0.000	-0.238	-0.243	sec
Peak Acceleration	0.146	0.0265	0.0265	g
Peak Displacement	0.00001	0.0	0.0	in
Sensor Check	Disabled	Disabled	Disabled	
Frequency	***	***	***	Hz
Overswing Ratio	***	***	***	

Peak Vector Sum 0.0505 in/s at 0.000 sec





Time Scale: 0.50 sec/div **Amplitude Scale:** Geo: 0.100 in/s/div
Trigger =

Sensor Check

Instantel Earth Dynamics Vibration Report

EARTH DYNAMICS
2284 NW Thurman St
Portland, OR 97210
(503) 227-7650
www.earthdyn.com

Histogram Start Time	00:02:02 July 1, 2012	**Serial Number**	BE12643 V 10.31-8.17 MiniMate Plus
Histogram Finish Time	17:34:51 July 1, 2012	**Battery Level**	6.4 Volts
Number of Intervals	1053 at 1 minute	**Unit Calibration**	June 21, 2012 by Instantel
Range	Geo:10.00 in/s	**File Name**	N643ECM5.FE0H
Sample Rate	1024sps		
Job Number:	1210		

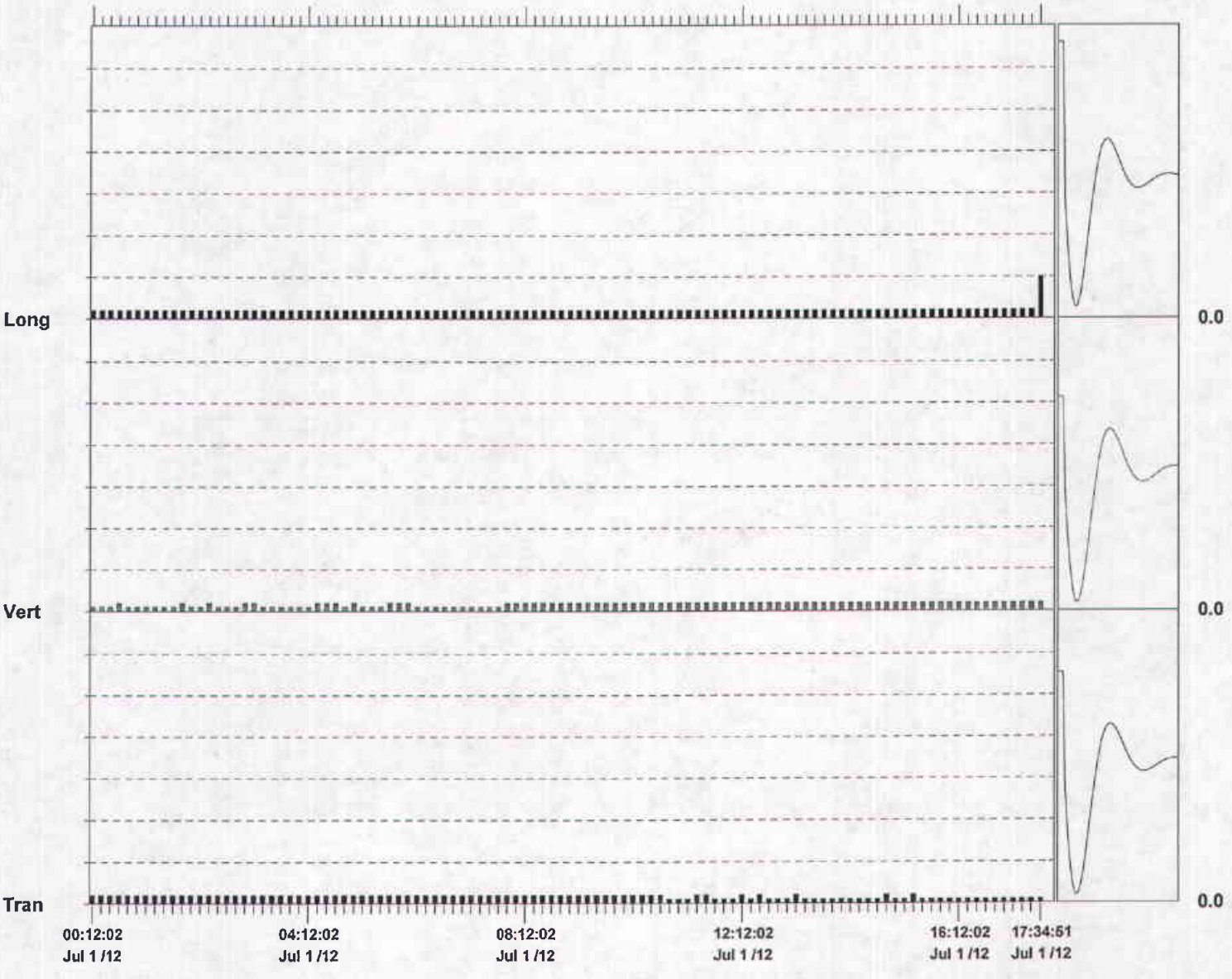
Notes

Location: Kennecott - Loc 5
Client: Kennecott
User Name: M. Feves (Earth Dynamics)
General: 35 Shaggy Mountain Dr., Herriman, UT

Extended Notes
Transducer BT1664

	Tran	Vert	Long	
PPV	0.01000	0.01000	0.0500	in/s
ZC Freq	>100	>100	>100	Hz
Date	Jul 1 /12	Jul 1 /12	Jul 1 /12	
Time	00:03:02	00:40:02	17:34:51	
Sensor Check	Passed	Passed	Passed	
Frequency	7.5	7.6	8.1	Hz
Overswing Ratio	3.7	3.4	3.5	

Peak Vector Sum 0.0502 in/s on July 1, 2012 at 17:34:51



Time Scale: 10 minutes /div **Amplitude Scale:** Geo: 0.0500 in/s/div

Sensor Check

Instantel Earth Dynamics Vibration Report

EARTH DYNAMICS
2294 NW Thurman St
Portland, OR 97210
(503) 227-7656
www.earthdyn.com

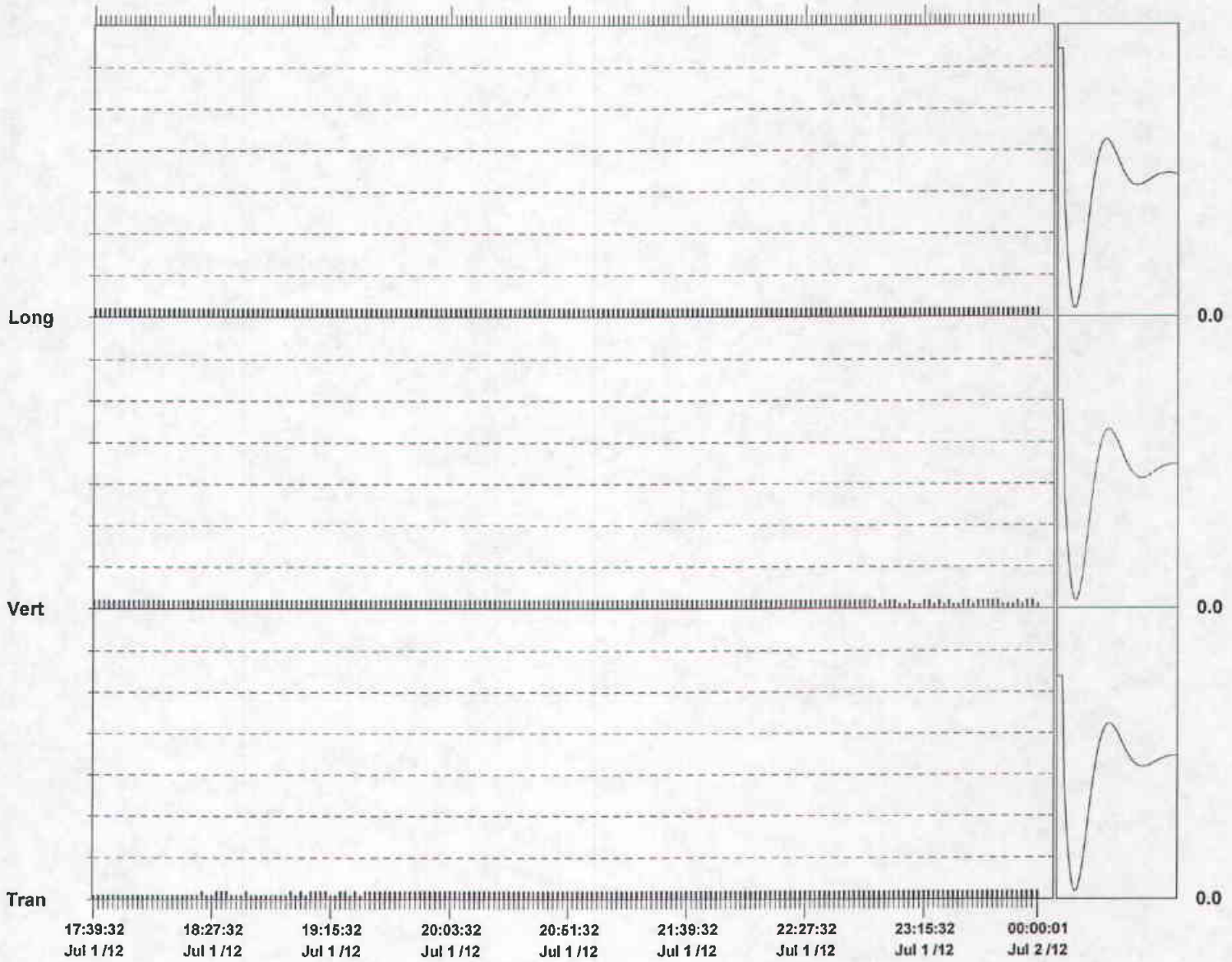
Histogram Start Time	17:37:32 July 1, 2012
Histogram Finish Time	00:00:01 July 2, 2012
Number of Intervals	383 at 1 minute
Range	Geo:10.00 in/s
Sample Rate	1024sps
Job Number:	1210
Notes	
Location:	Kennecott - Loc 5
Client:	Kennecott
User Name:	M. Feves (Earth Dynamics)
General:	35 Shaggy Mountain Dr., Herriman, UT

Serial Number	BE12643 V 10.31-8.17 MiniMate Plus
Battery Level	6.6 Volts
Unit Calibration	June 21, 2012 by Instantel
File Name	N643ECNI.AK0H

Extended Notes
Transducer BT1664

	Tran	Vert	Long	
PPV	0.01000	0.01000	0.01000	in/s
ZC Freq	>100	>100	>100	Hz
Date	Jul 1 /12	Jul 1 /12	Jul 1 /12	
Time	18:23:32	17:38:32	17:38:32	
Sensor Check	Passed	Passed	Passed	
Frequency	7.5	7.6	8.1	Hz
Overswing Ratio	3.9	3.6	3.8	

Peak Vector Sum 0.0150 in/s on July 1, 2012 at 18:17:32



Time Scale: 2 minutes /div **Amplitude Scale:** Geo: 0.0500 in/s/div

Sensor Check

Instantel Earth Dynamics Vibration Report

EARTH DYNAMICS
2284 NW Thurman St
Portland, OR 97210
(503) 227-7650
www.earthdyn.com

Date/Time	Long at 17:34:36 July 1, 2012
Trigger Source	Geo: 0.0400 in/s
Range	Geo: 10.00 in/s
Record Time	15.0 sec at 1024 sps
Job Number:	1210
Notes	
Location:	Kennecott - Loc 5
Client:	Kennecott
User Name:	M. Feves (Earth Dynamics)
General:	35 Shaggy Mountain Dr., Herriman, UT

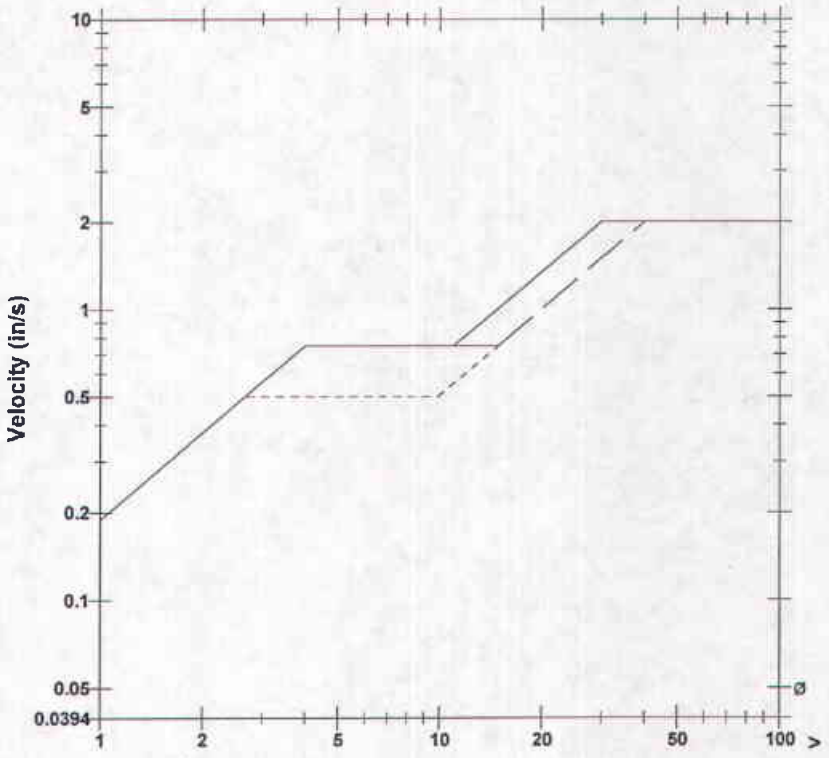
Serial Number	BE12643 V 10.31-8.17 MiniMate Plus
Battery Level	6.5 Volts
Unit Calibration	June 21, 2012 by Instantel
File Name	N643ECNI.5O0W

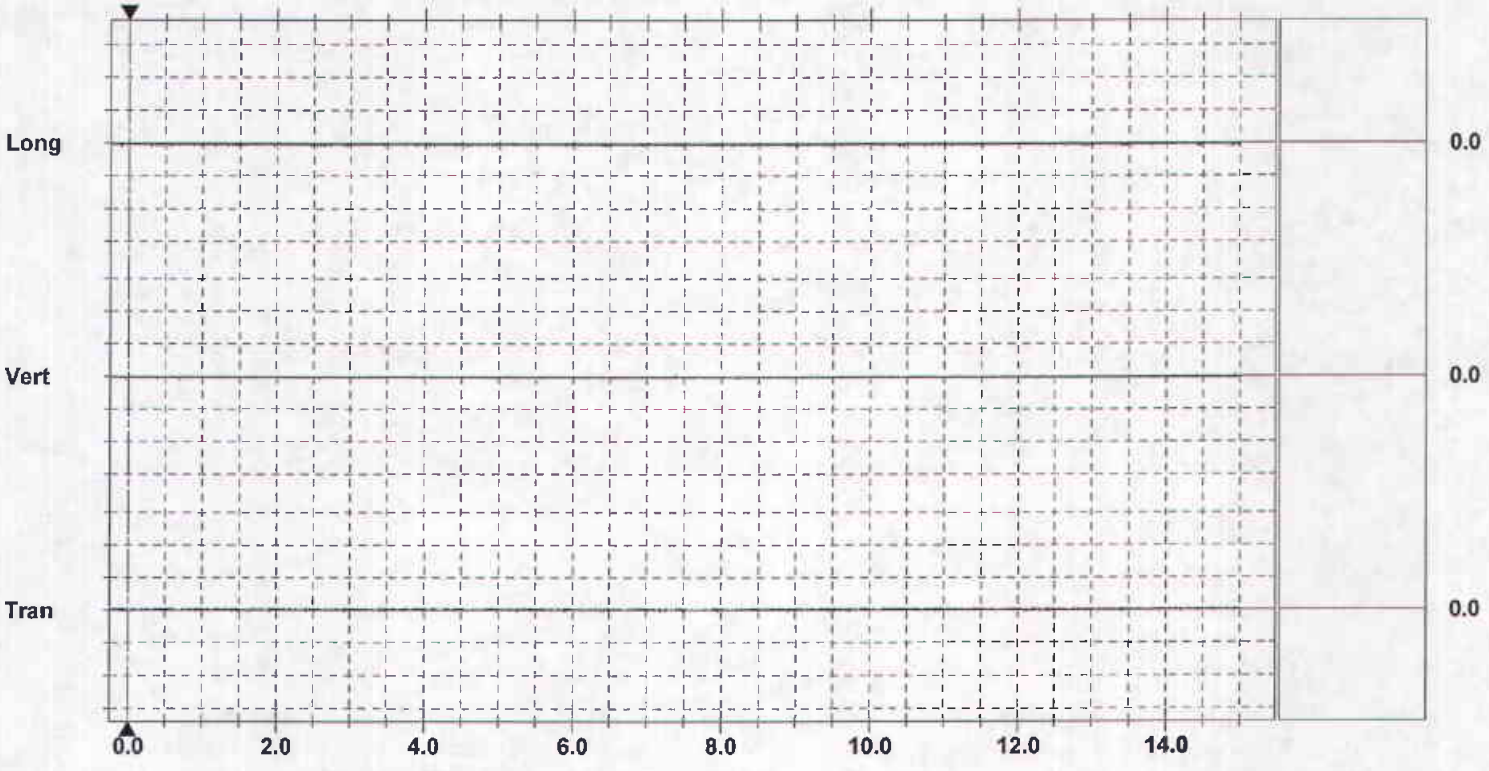
Extended Notes
Combo Mode July 1, 2012 00:02:01
Transducer BT1664

	Tran	Vert	Long	
PPV	0.00500	0.01000	0.0500	in/s
ZC Freq	>100	>100	>100	Hz
Time (Rel. to Trig)	-0.247	-0.033	0.000	sec
Peak Acceleration	0.0265	0.0265	0.119	g
Peak Displacement	0.0	0.00000	0.00002	in
Sensor Check	Disabled	Disabled	Disabled	
Frequency	***	***	***	Hz
Overswing Ratio	***	***	***	

Peak Vector Sum 0.0502 in/s at 0.000 sec

USBM RI8507 And OSMRE





Time Scale: 0.50 sec/div **Amplitude Scale:** Geo: 0.100 in/s/div
Trigger =

Sensor Check

Instantel

Earth Dynamics Vibration Report

EARTH DYNAMICS
2264 NW Thurman St
Portland, OR 97210
(503) 227-7659
www.earthdyn.com

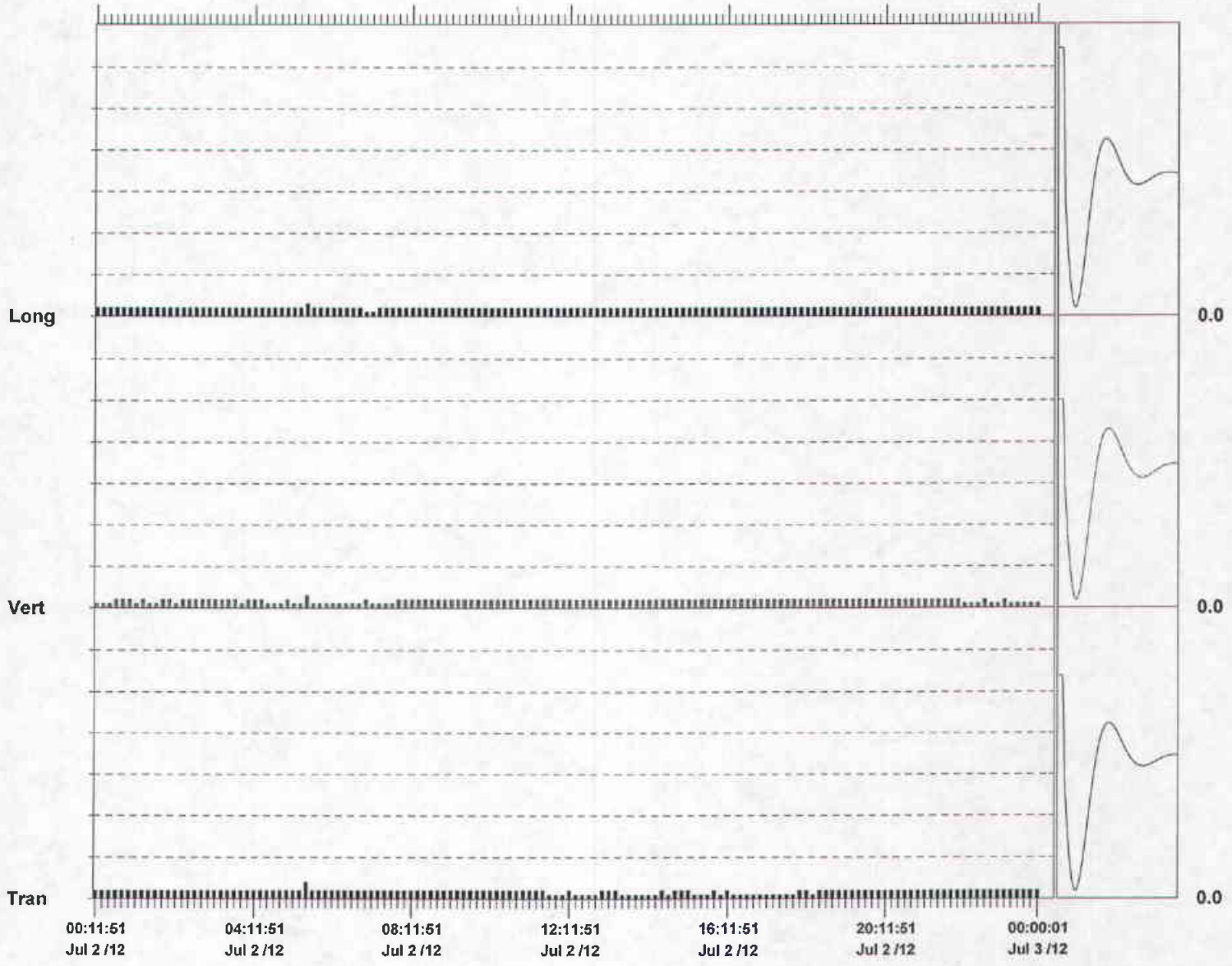
Histogram Start Time 00:01:51 July 2, 2012
Histogram Finish Time 00:00:01 July 3, 2012
Number of Intervals 1439 at 1 minute
Range Geo:10.00 in/s
Sample Rate 1024sps
Job Number: 1210
Notes
Location: Kennecott - Loc 5
Client: Kennecott
User Name: M. Feves (Earth Dynamics)
General: 35 Shaggy Mountain Dr., Herriman, UT

Serial Number BE12643 V 10.31-8.17 MiniMate Plus
Battery Level 6.6 Volts
Unit Calibration June 21, 2012 by Instantel
File Name N643ECO0.330H

Extended Notes
Transducer BT1664

	Tran	Vert	Long	
PPV	0.0200	0.0150	0.0150	in/s
ZC Freq	>100	>100	>100	Hz
Date	Jul 2 /12	Jul 2 /12	Jul 2 /12	
Time	05:22:51	05:22:51	05:22:51	
Sensor Check	Passed	Passed	Passed	
Frequency	7.5	7.6	8.1	Hz
Overswing Ratio	3.9	3.5	3.8	

Peak Vector Sum 0.0292 in/s on July 2, 2012 at 05:22:51



Time Scale: 10 minutes /div **Amplitude Scale:** Geo: 0.0500 in/s/div

Sensor Check

Instantel Earth Dynamics Vibration Report

EARTH DYNAMICS
2294 NW Thurman St
Portland, OR 97210
(503) 227-7656
www.earthdyn.com

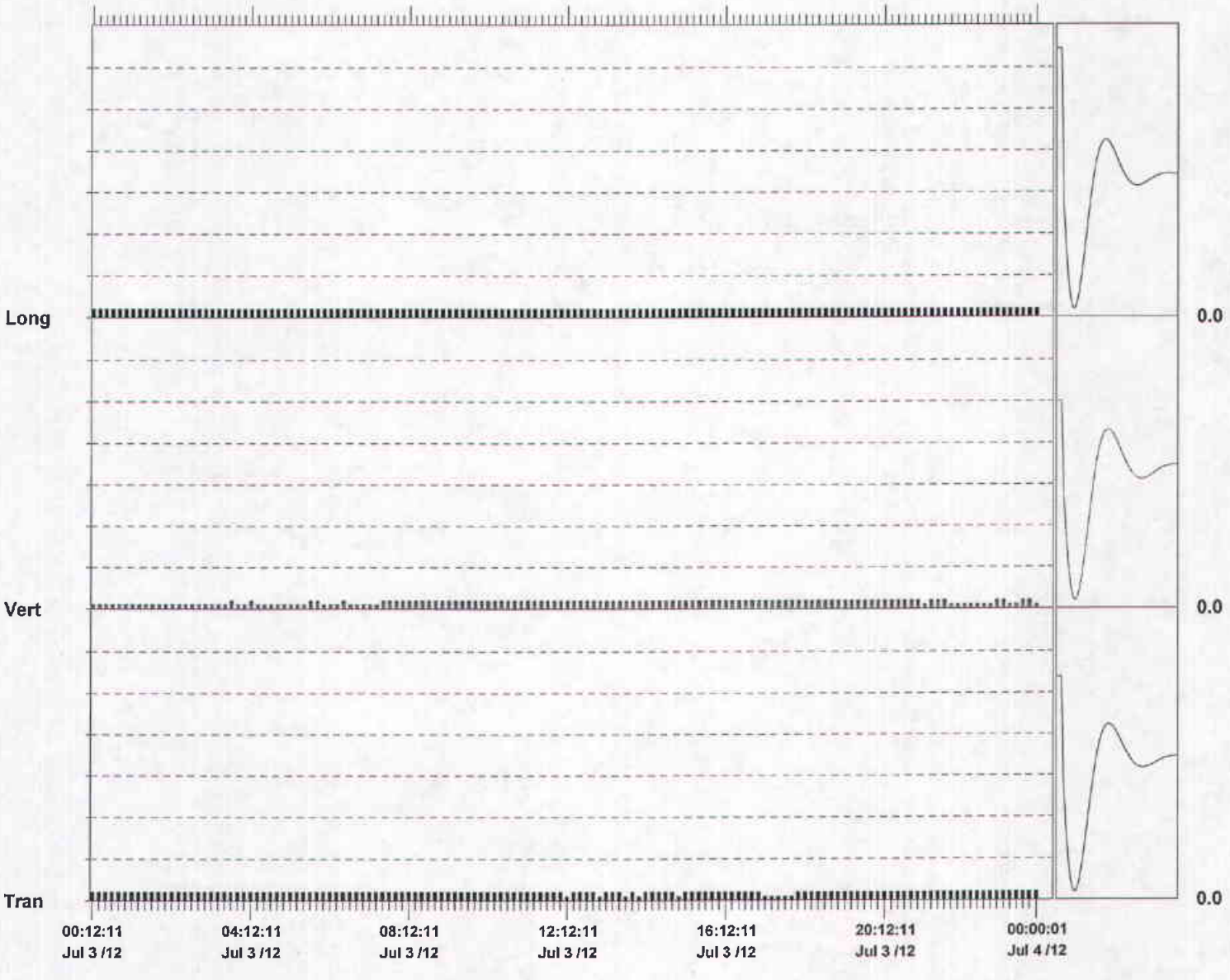
Histogram Start Time 00:02:11 July 3, 2012
Histogram Finish Time 00:00:01 July 4, 2012
Number of Intervals 1438 at 1 minute
Range Geo:10.00 in/s
Sample Rate 1024sps
Job Number: 1210
Notes
Location: Kennecott - Loc 5
Client: Kennecott
User Name: M. Feves (Earth Dynamics)
General: 35 Shaggy Mountain Dr., Herriman, UT

Serial Number BE12643 V 10.31-8.17 MiniMate Plus
Battery Level 6.7 Volts
Unit Calibration June 21, 2012 by Instantel
File Name N643ECPU.RN0H

Extended Notes
Transducer BT1664

	Tran	Vert	Long	
PPV	0.01000	0.01000	0.01000	in/s
ZC Freq	>100	>100	>100	Hz
Date	Jul 3 /12	Jul 3 /12	Jul 3 /12	
Time	00:03:11	03:34:11	00:04:11	
Sensor Check	Passed	Passed	Passed	
Frequency	7.4	7.6	8.1	Hz
Overswing Ratio	3.9	3.6	3.8	

Peak Vector Sum 0.0150 in/s on July 3, 2012 at 10:53:11



Time Scale: 10 minutes /div **Amplitude Scale:** Geo: 0.0500 in/s/div

Sensor Check

Instantel Earth Dynamics Vibration Report

EARTH DYNAMICS
2284 NW Thurman St
Portland, OR 97210
(503) 227-7656
www.earthdyn.com

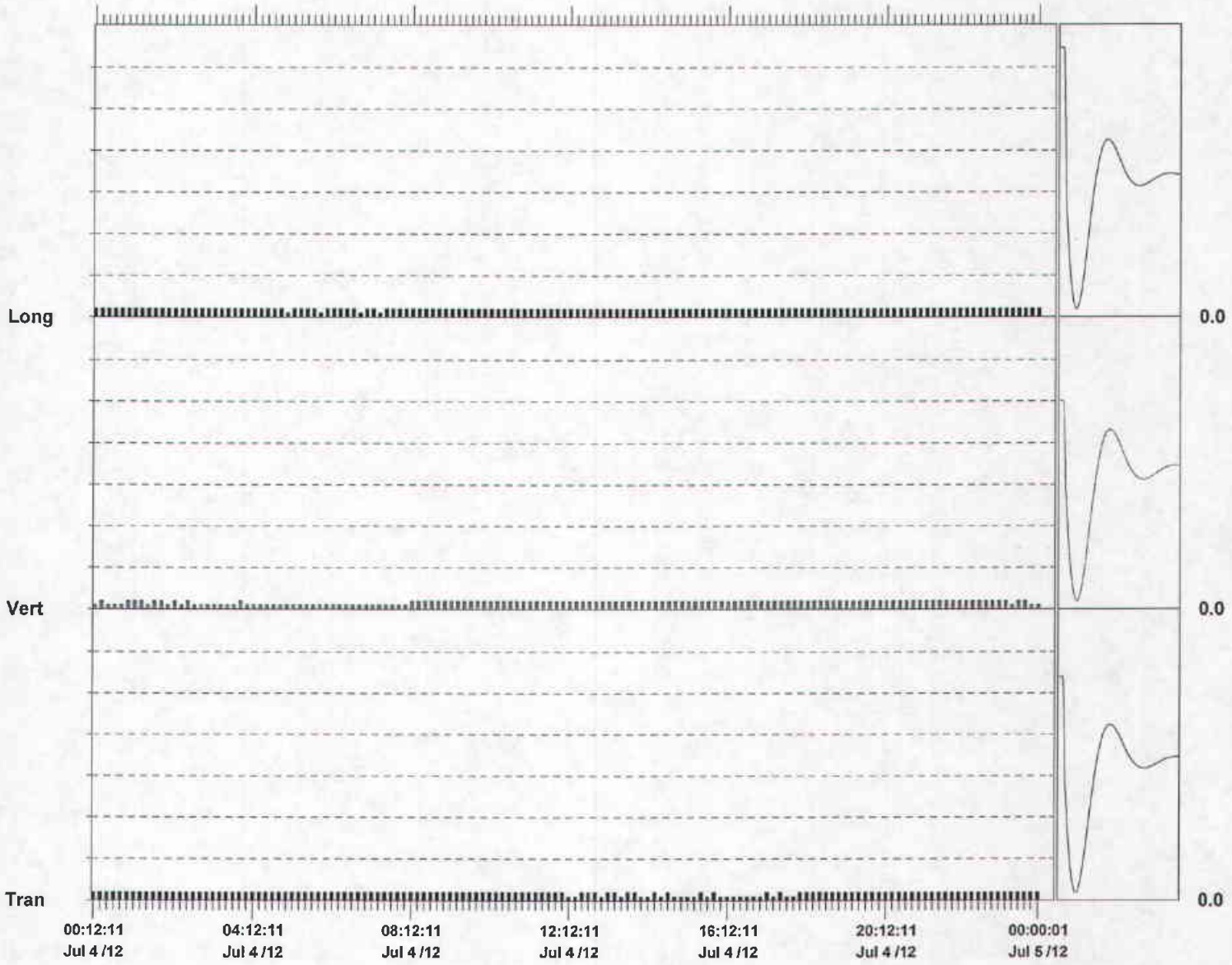
Histogram Start Time 00:02:11 July 4, 2012
Histogram Finish Time 00:00:01 July 5, 2012
Number of Intervals 1438 at 1 minute
Range Geo:10.00 in/s
Sample Rate 1024sps
Job Number: 1210
Notes
Location: Kennecott - Loc 5
Client: Kennecott
User Name: M. Feves (Earth Dynamics)
General: 35 Shaggy Mountain Dr., Herriman, UT

Serial Number BE12643 V 10.31-8.17 MiniMate Plus
Battery Level 6.6 Volts
Unit Calibration June 21, 2012 by Instantel
File Name N643ECRP.FN0H

Extended Notes
Transducer BT1664

	Tran	Vert	Long	
PPV	0.01000	0.01000	0.01000	in/s
ZC Freq	>100	>100	>100	Hz
Date	Jul 4 /12	Jul 4 /12	Jul 4 /12	
Time	00:03:11	00:13:11	00:03:11	
Sensor Check	Passed	Passed	Passed	
Frequency	7.5	7.6	8.1	Hz
Overswing Ratio	3.9	3.5	3.8	

Peak Vector Sum 0.0150 in/s on July 4, 2012 at 10:28:11



Time Scale: 10 minutes /div **Amplitude Scale:** Geo: 0.0500 in/s/div

Sensor Check

Instantel Earth Dynamics Vibration Report

EARTH DYNAMICS
2284 NW Thurman St
Portland, OR 97210
(503) 227-7659
www.earthdyn.com

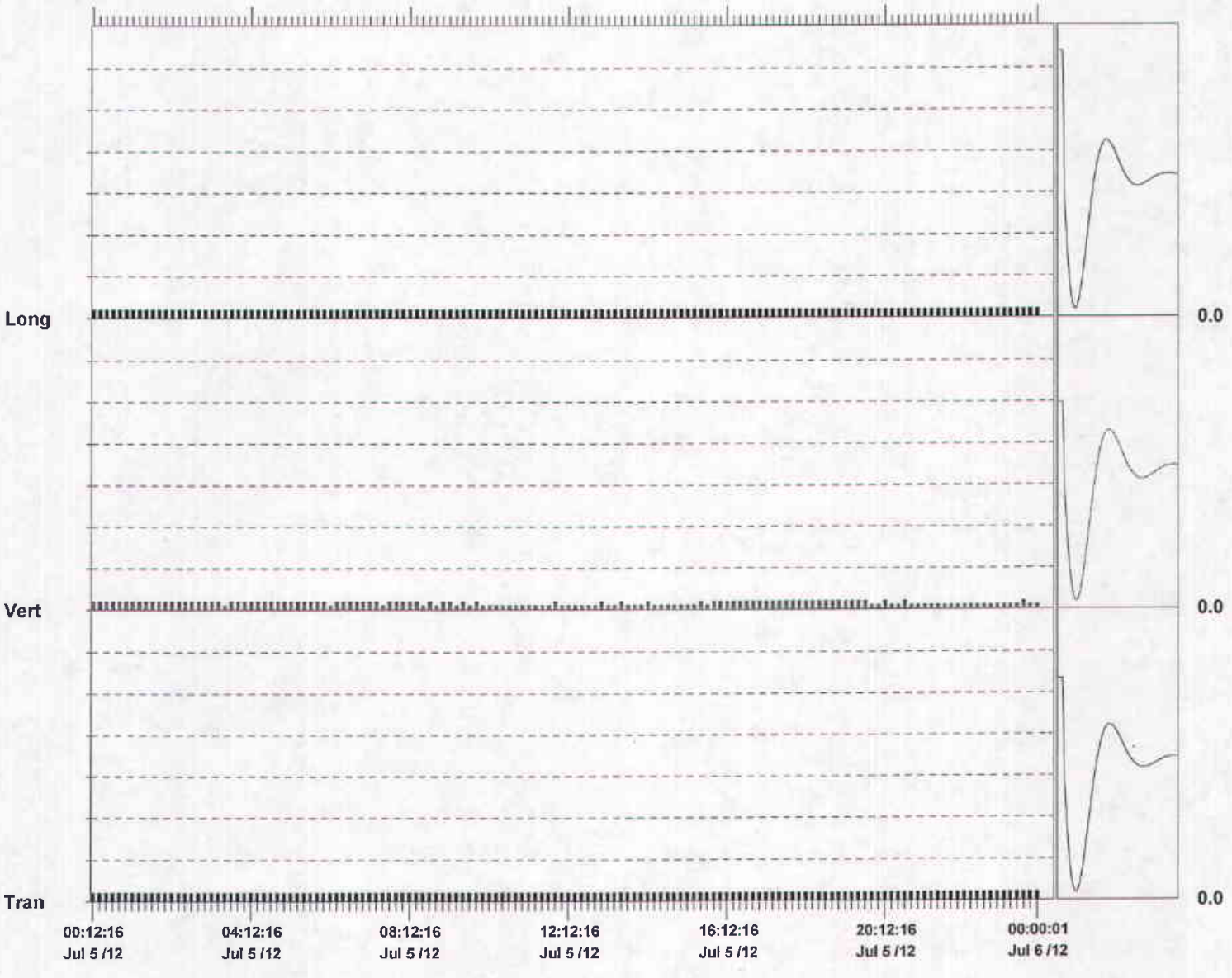
Histogram Start Time 00:02:16 July 5, 2012
Histogram Finish Time 00:00:01 July 6, 2012
Number of Intervals 1438 at 1 minute
Range Geo:10.00 in/s
Sample Rate 1024sps
Job Number: 1210
Notes
Location: Kennecott - Loc 5
Client: Kennecott
User Name: M. Feves (Earth Dynamics)
General: 35 Shaggy Mountain Dr., Herriman, UT

Serial Number BE12643 V 10.31-8.17 MiniMate Plus
Battery Level 6.7 Volts
Unit Calibration June 21, 2012 by Instantel
File Name N643ECTK.3S0H

Extended Notes
Transducer BT1664

	Tran	Vert	Long	
PPV	0.01000	0.01000	0.01000	in/s
ZC Freq	>100	>100	>100	Hz
Date	Jul 5 /12	Jul 5 /12	Jul 5 /12	
Time	00:03:16	00:09:16	00:03:16	
Sensor Check	Passed	Passed	Passed	
Frequency	7.4	7.5	7.9	Hz
Overswing Ratio	4.0	3.6	3.8	

Peak Vector Sum 0.0122 in/s on July 5, 2012 at 00:03:16



Time Scale: 10 minutes /div **Amplitude Scale:** Geo: 0.0500 in/s/div

Sensor Check

Instantel Earth Dynamics Vibration Report

EARTH DYNAMICS
2294 NW Thurman St
Portland, OR 97210
(503) 227-7696
www.earthdyn.com

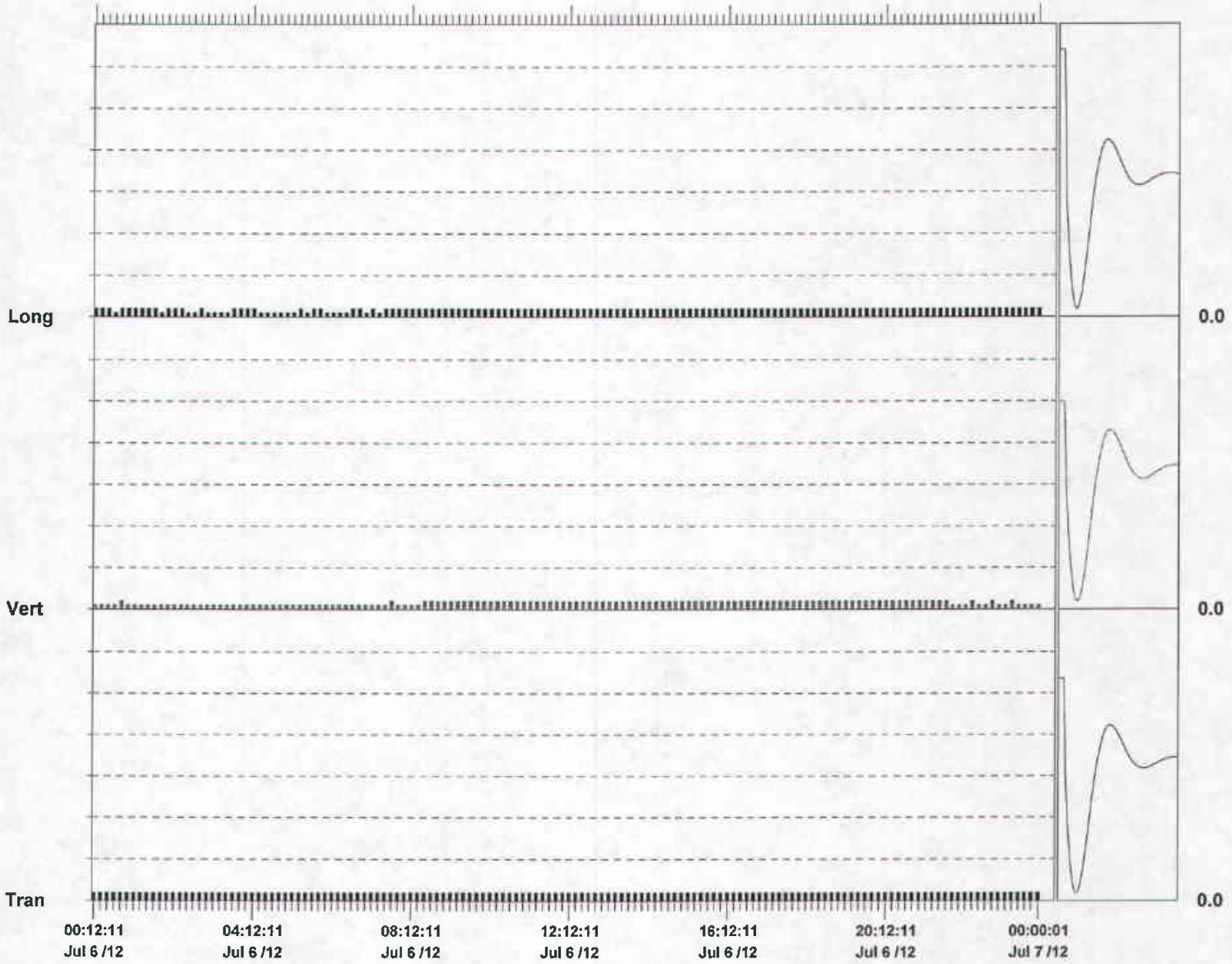
Histogram Start Time	00:02:11 July 6, 2012
Histogram Finish Time	00:00:01 July 7, 2012
Number of Intervals	1438 at 1 minute
Range	Geo:10.00 in/s
Sample Rate	1024sps
Job Number:	1210
Notes	
Location:	Kennecott - Loc 5
Client:	Kennecott
User Name:	M. Feves (Earth Dynamics)
General:	35 Shaggy Mountain Dr., Herriman, UT

Serial Number	BE12643 V 10.31-8.17 MiniMate Plus
Battery Level	6.7 Volts
Unit Calibration	June 21, 2012 by Instantel
File Name	N643ECVE.RN0H

Extended Notes
Transducer BT1664

	Tran	Vert	Long	
PPV	0.01000	0.01000	0.01000	in/s
ZC Freq	>100	>100	>100	Hz
Date	Jul 6 /12	Jul 6 /12	Jul 6 /12	
Time	00:03:11	00:48:11	00:03:11	
Sensor Check	Passed	Passed	Passed	
Frequency	7.4	7.6	8.1	Hz
Overswing Ratio	3.9	3.6	3.8	

Peak Vector Sum 0.0141 in/s on July 6, 2012 at 11:43:11



Time Scale: 10 minutes /div **Amplitude Scale:**Geo: 0.0500 in/s/div

Sensor Check

Instantel

Earth Dynamics Vibration Report

EARTH DYNAMICS
2284 NW Thurman St
Portland, OR 97210
(503) 227-7659
www.earthdyn.com

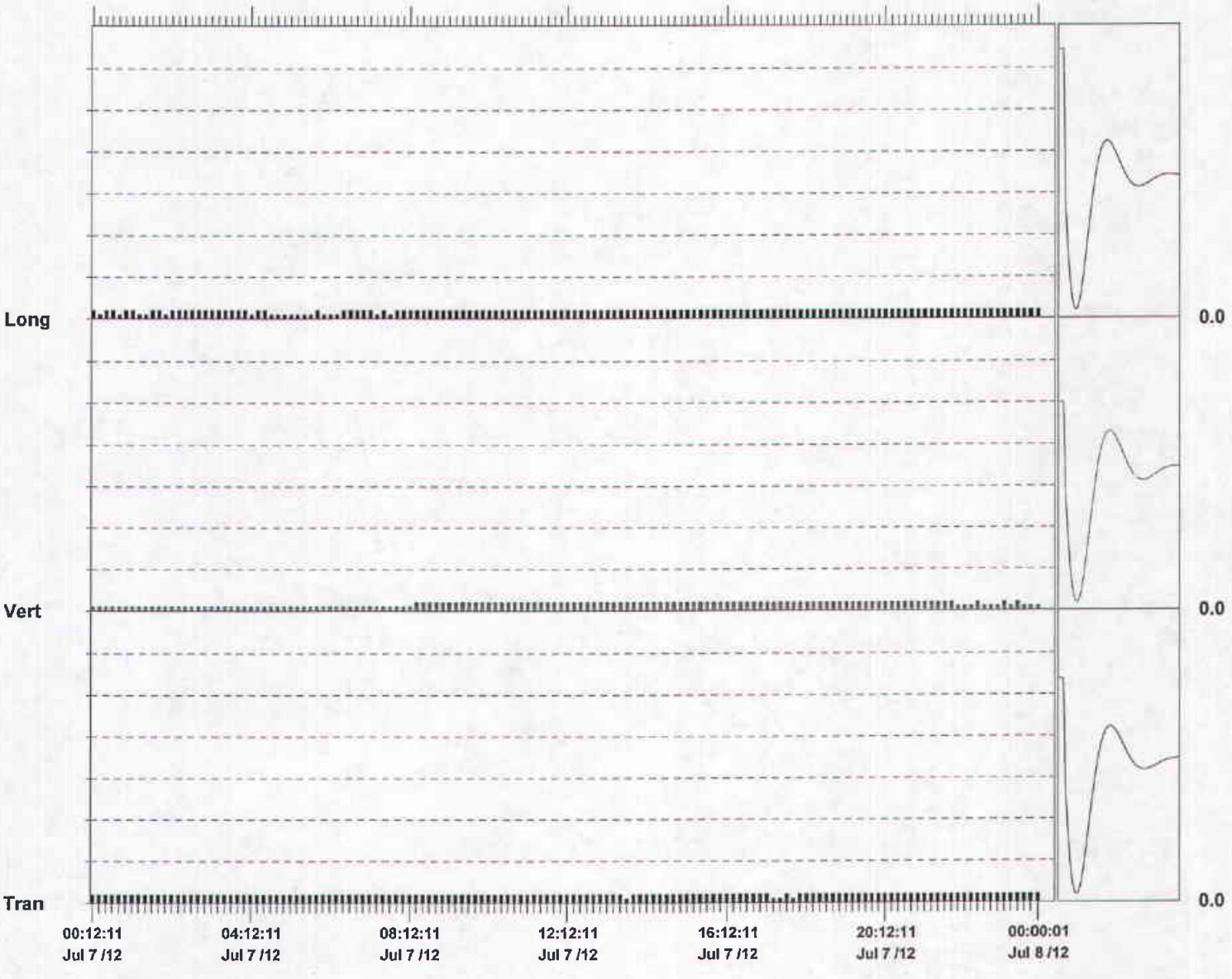
Histogram Start Time 00:02:11 July 7, 2012
Histogram Finish Time 00:00:01 July 8, 2012
Number of Intervals 1438 at 1 minute
Range Geo:10.00 in/s
Sample Rate 1024sps
Job Number: 1210
Notes
Location: Kennecott - Loc 5
Client: Kennecott
User Name: M. Feves (Earth Dynamics)
General: 35 Shaggy Mountain Dr., Herriman, UT

Serial Number BE12643 V 10.31-8.17 MiniMate Plus
Battery Level 6.7 Volts
Unit Calibration June 21, 2012 by Instantel
File Name N643ECX9.FN0H

Extended Notes
Transducer BT1664

	Tran	Vert	Long	
PPV	0.01000	0.01000	0.01000	in/s
ZC Freq	>100	>100	>100	Hz
Date	Jul 7 /12	Jul 7 /12	Jul 7 /12	
Time	00:03:11	08:17:11	00:04:11	
Sensor Check	Passed	Passed	Passed	
Frequency	7.5	7.6	8.1	Hz
Overswing Ratio	3.9	3.6	3.8	

Peak Vector Sum 0.0150 in/s on July 7, 2012 at 16:52:11



Time Scale: 10 minutes /div **Amplitude Scale:** Geo: 0.0500 in/s/div

Sensor Check

Instantel Earth Dynamics Vibration Report

EARTH DYNAMICS
2284 NW Thurman St
Portland, OR 97210
(503) 227-7656
www.earthdyn.com

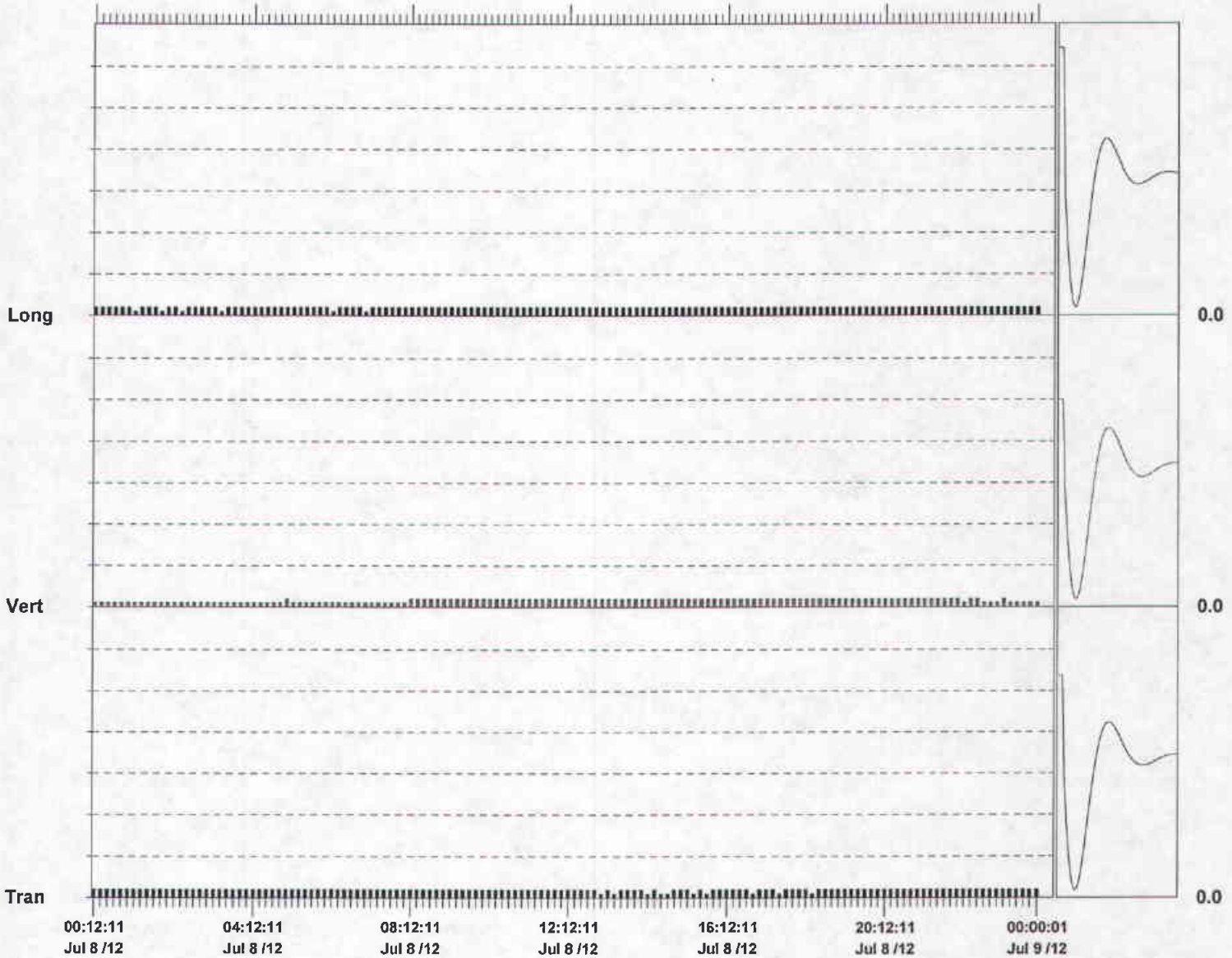
Histogram Start Time 00:02:11 July 8, 2012
Histogram Finish Time 00:00:01 July 9, 2012
Number of Intervals 1438 at 1 minute
Range Geo:10.00 in/s
Sample Rate 1024sps
Job Number: 1210
Notes
Location: Kennecott - Loc 5
Client: Kennecott
User Name: M. Feves (Earth Dynamics)
General: 35 Shaggy Mountain Dr., Herriman, UT

Serial Number BE12643 V 10.31-8.17 MiniMate Plus
Battery Level 6.7 Volts
Unit Calibration June 21, 2012 by Instantel
File Name N643ECZ4.3N0H

Extended Notes
Transducer BT1664

	Tran	Vert	Long	
PPV	0.01000	0.01000	0.01000	in/s
ZC Freq	>100	>100	>100	Hz
Date	Jul 8 /12	Jul 8 /12	Jul 8 /12	
Time	00:03:11	05:02:11	00:03:11	
Sensor Check	Passed	Passed	Passed	
Frequency	7.5	7.6	8.1	Hz
Overswing Ratio	3.9	3.6	3.8	

Peak Vector Sum 0.0150 in/s on July 8, 2012 at 17:01:11



Time Scale: 10 minutes /div **Amplitude Scale:** Geo: 0.0500 in/s/div

Sensor Check

Instantel Earth Dynamics Vibration Report

EARTH DYNAMICS
2284 NW Thurman St
Portland, OR 97210
(503) 227-7650
www.earthdyn.com

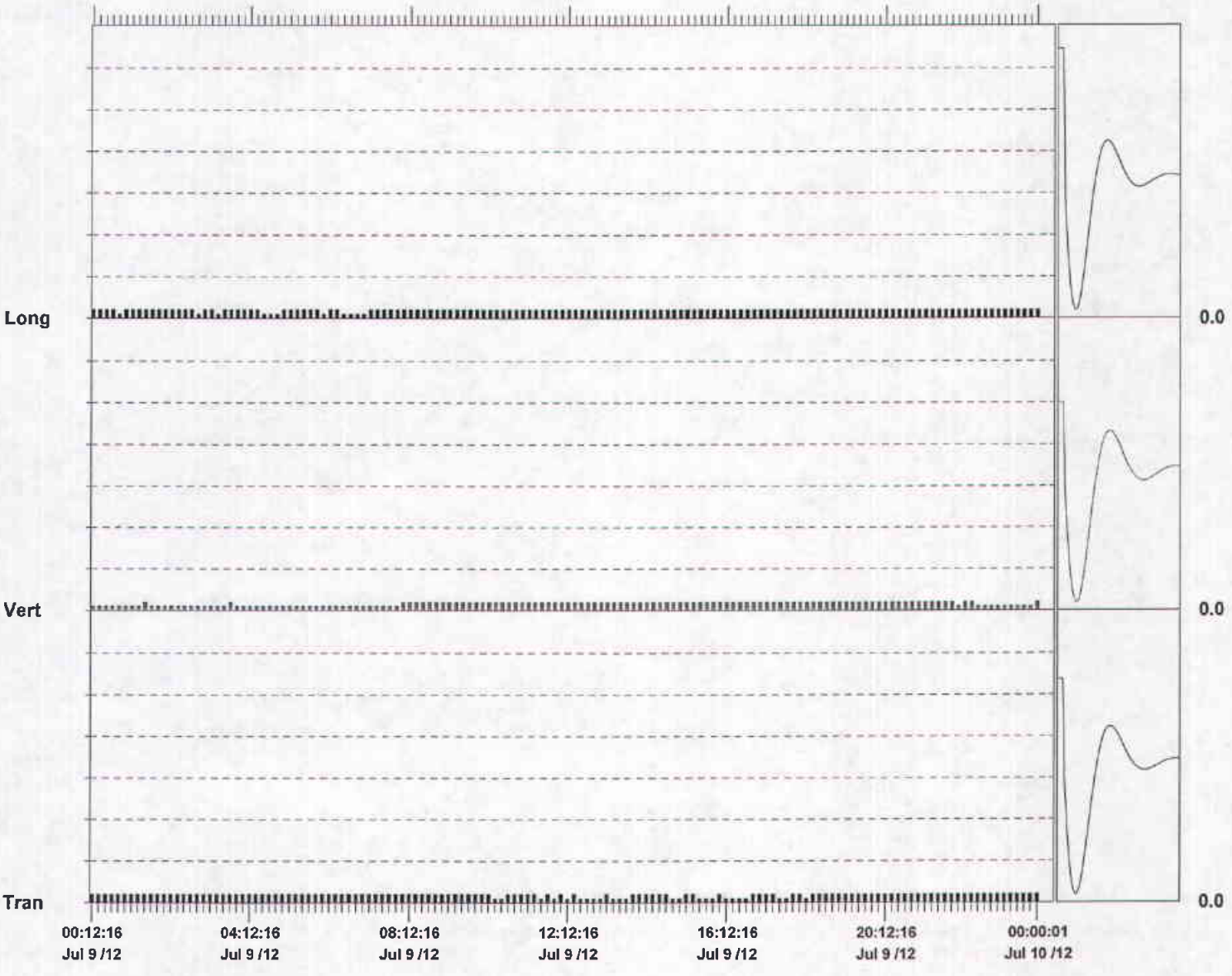
Histogram Start Time 00:02:16 July 9, 2012
Histogram Finish Time 00:00:01 July 10, 2012
Number of Intervals 1438 at 1 minute
Range Geo:10.00 in/s
Sample Rate 1024sps
Job Number: 1210
Notes
Location: Kennecott - Loc 5
Client: Kennecott
User Name: M. Feves (Earth Dynamics)
General: 35 Shaggy Mountain Dr., Herriman, UT

Serial Number BE12643 V 10.31-8.17 MiniMate Plus
Battery Level 6.6 Volts
Unit Calibration June 21, 2012 by Instantel
File Name N643ED0Y.RS0H

Extended Notes
Transducer BT1664

	Tran	Vert	Long	
PPV	0.01000	0.01000	0.01000	in/s
ZC Freq	>100	>100	>100	Hz
Date	Jul 9 /12	Jul 9 /12	Jul 9 /12	
Time	00:03:16	01:27:16	00:03:16	
Sensor Check	Passed	Passed	Passed	
Frequency	7.4	7.6	8.1	Hz
Overswing Ratio	3.9	3.5	3.8	

Peak Vector Sum 0.0150 in/s on July 9, 2012 at 11:08:16



Time Scale: 10 minutes /div **Amplitude Scale:** Geo: 0.0500 in/s/div

Sensor Check

Instantel Earth Dynamics Vibration Report

EARTH DYNAMICS
2294 NW Thurman St
Portland, OR 97210
(503) 227-7694
www.earthdyn.com

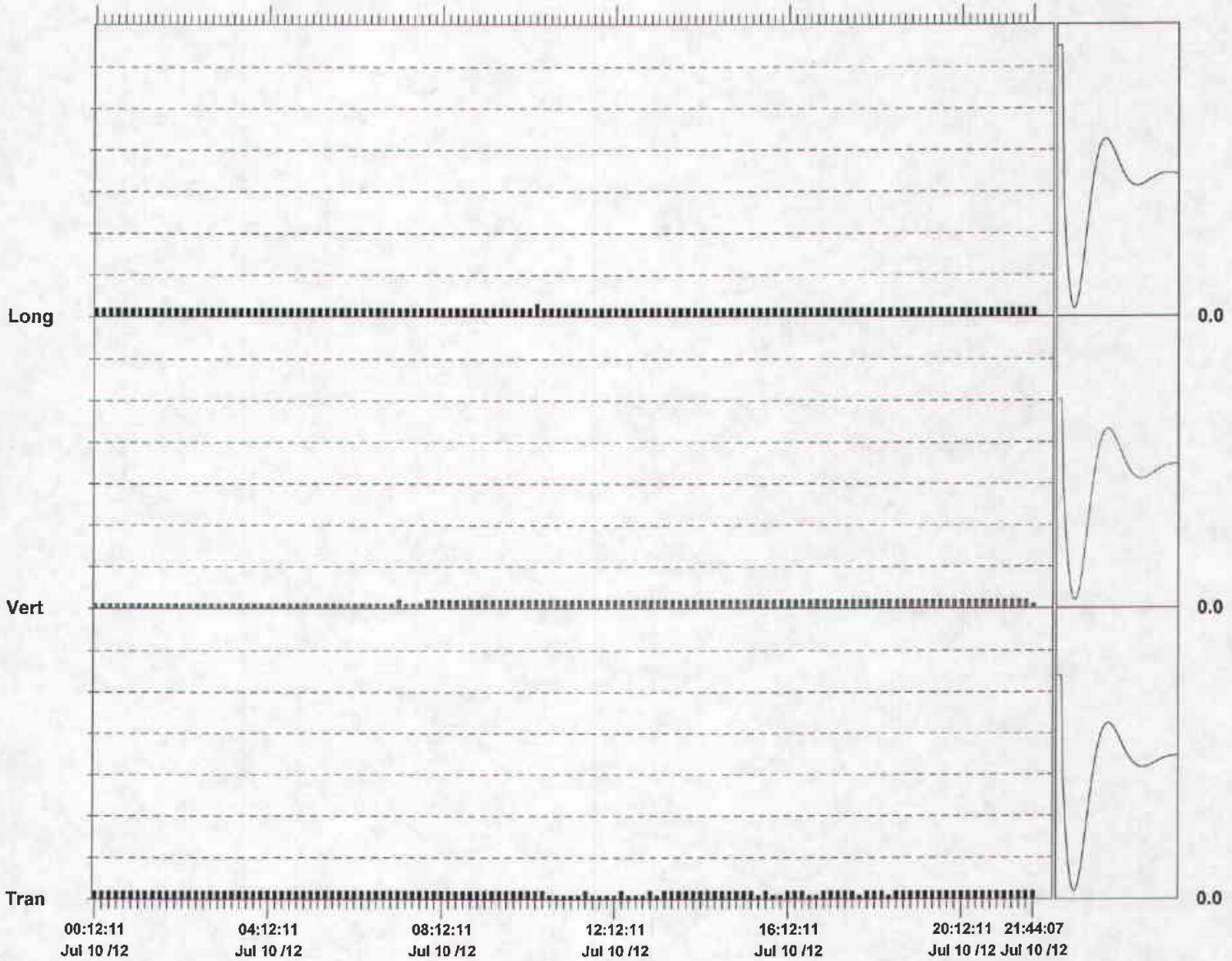
Histogram Start Time	00:02:11 July 10, 2012
Histogram Finish Time	21:44:07 July 10, 2012
Number of Intervals	1301 at 1 minute
Range	Geo:10.00 in/s
Sample Rate	1024sps
Job Number:	1210
Notes	
Location:	Kennecott - Loc 5
Client:	Kennecott
User Name:	M. Feves (Earth Dynamics)
General:	35 Shaggy Mountain Dr., Herriman, UT

Serial Number	BE12643 V 10.31-8.17 MiniMate Plus
Battery Level	6.6 Volts
Unit Calibration	June 21, 2012 by Instantel
File Name	N643ED2T.FN0H

Extended Notes
Transducer BT1664

	Tran	Vert	Long	
PPV	0.01000	0.01000	0.0150	in/s
ZC Freq	>100	>100	>100	Hz
Date	Jul 10 /12	Jul 10 /12	Jul 10 /12	
Time	00:03:11	07:11:11	10:16:11	
Sensor Check	Passed	Passed	Passed	
Frequency	7.5	7.6	8.1	Hz
Overswing Ratio	3.9	3.5	3.7	

Peak Vector Sum 0.0158 in/s on July 10, 2012 at 10:16:11



Time Scale: 10 minutes /div **Amplitude Scale:** Geo: 0.0500 in/s/div Sensor Check

Instantel Earth Dynamics Vibration Report

EARTH DYNAMICS
3294 NW Thurman St
Portland, OR 97210
(902) 227-7059
www.earthdyn.com

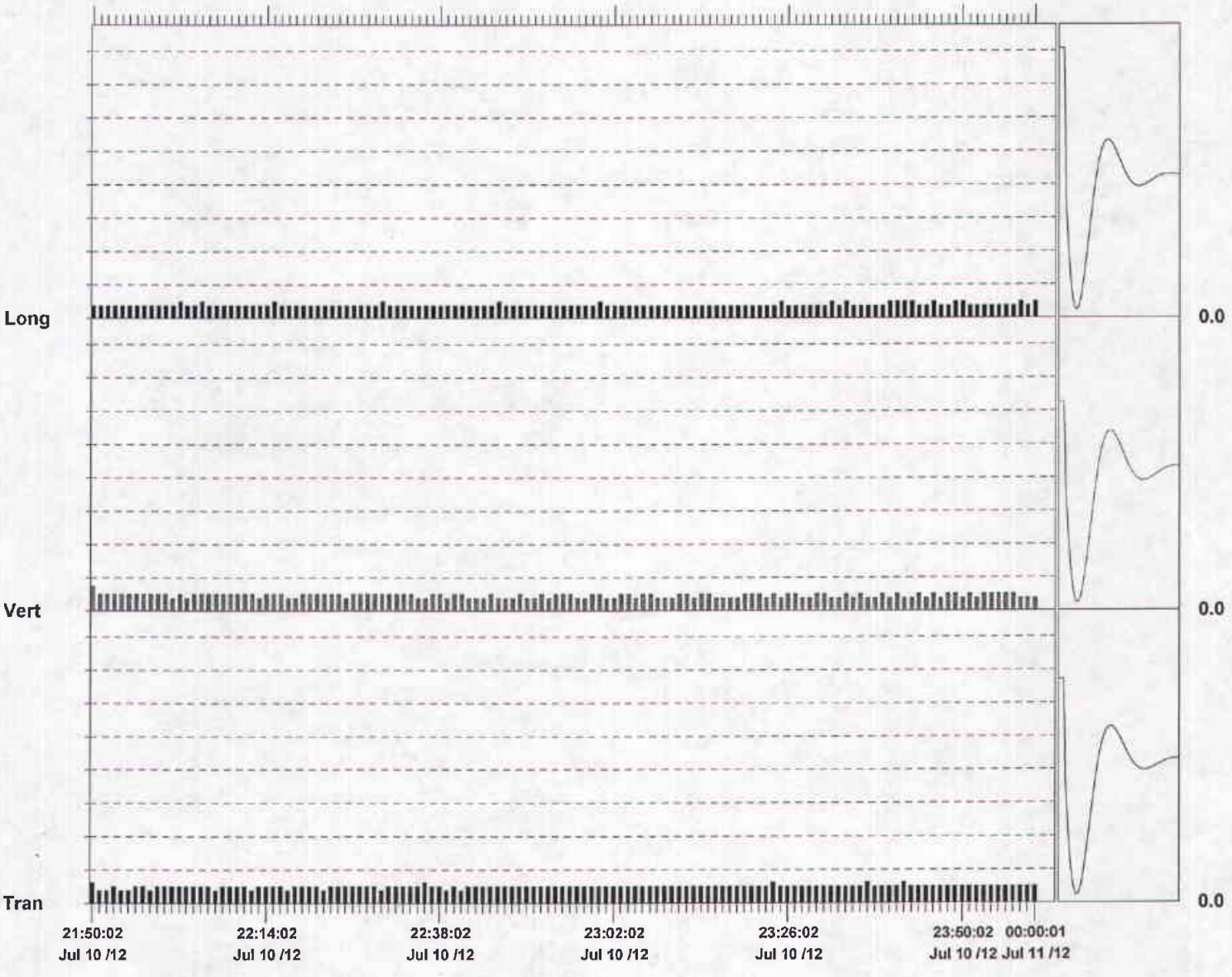
Histogram Start Time 21:49:02 July 10, 2012
Histogram Finish Time 00:00:01 July 11, 2012
Number of Intervals 131 at 1 minute
Range Geo:1.25 in/s
Sample Rate 1024sps
Job Number: 1210
Notes
Location: Kennecott - Loc 5
Client: Kennecott
User Name: M. Feves (Earth Dynamics)
General: 35 Shaggy Mountain Dr., Herriman, UT

Serial Number BE12643 V 10.31-8.17 MiniMate Plus
Battery Level 6.6 Volts
Unit Calibration June 21, 2012 by Instantel
File Name N643ED4H.XQ0H

Extended Notes
Transducer BT1664

	Tran	Vert	Long	
PPV	0.00312	0.00375	0.00250	in/s
ZC Freq	5.8	<1.0	>100	Hz
Date	Jul 10 /12	Jul 10 /12	Jul 10 /12	
Time	21:50:02	21:50:02	22:02:02	
Sensor Check	Passed	Passed	Passed	
Frequency	7.4	7.6	8.1	Hz
Overswing Ratio	3.9	3.5	3.8	

Peak Vector Sum 0.00468 in/s on July 10, 2012 at 21:50:02



Time Scale: 1 minute /div **Amplitude Scale:** Geo: 0.00500 in/s/div

Sensor Check

Instantel Earth Dynamics Vibration Report

EARTH DYNAMICS
2294 NW Thurman St
Portland, OR 97210
(503) 227-7698
www.earthdyn.com

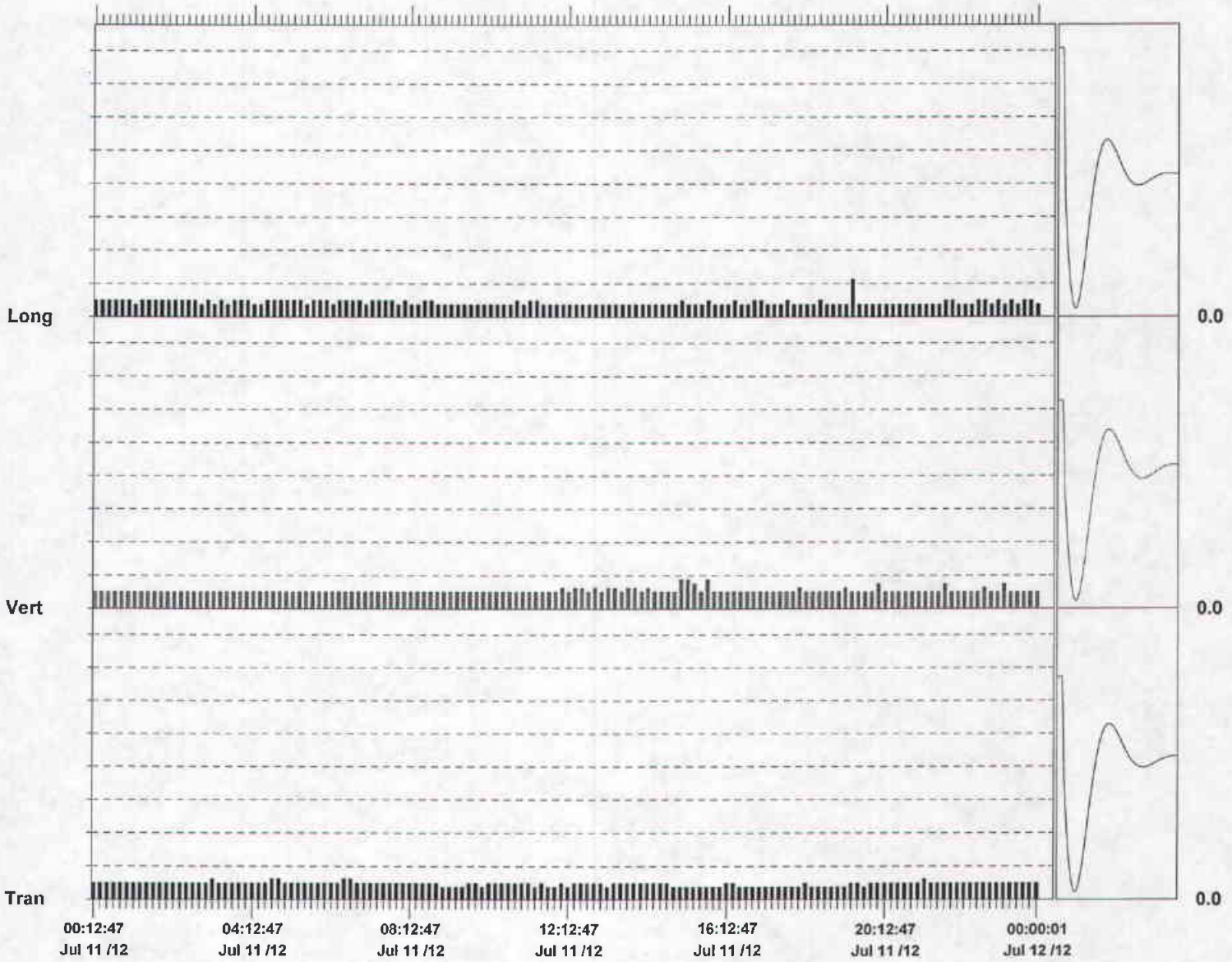
Histogram Start Time 00:02:47 July 11, 2012
Histogram Finish Time 00:00:01 July 12, 2012
Number of Intervals 1438 at 1 minute
Range Geo:1.25 in/s
Sample Rate 1024sps
Job Number: 1210
Notes
Location: Kennecott - Loc 5
Client: Kennecott
User Name: M. Feves (Earth Dynamics)
General: 35 Shaggy Mountain Dr., Herriman, UT

Serial Number BE12643 V 10.31-8.17 MiniMate Plus
Battery Level 6.6 Volts
Unit Calibration June 21, 2012 by Instantel
File Name N643ED4O.4N0H

Extended Notes
Transducer BT1664

	Tran	Vert	Long	
PPV	0.00312	0.00437	0.00562	in/s
ZC Freq	>100	1.0	26	Hz
Date	Jul 11 /12	Jul 11 /12	Jul 11 /12	
Time	03:11:47	14:57:47	19:17:47	
Sensor Check	Passed	Passed	Passed	
Frequency	7.5	7.6	8.1	Hz
Overswing Ratio	3.9	3.5	3.8	

Peak Vector Sum 0.00566 in/s on July 11, 2012 at 19:17:47



Time Scale: 10 minutes /div **Amplitude Scale:** Geo: 0.00500 in/s/div

Sensor Check

Instantel Earth Dynamics Vibration Report

EARTH DYNAMICS
2294 NW Thurman St
Portland, OR 97210
(503) 227-7999
www.earthdyn.com

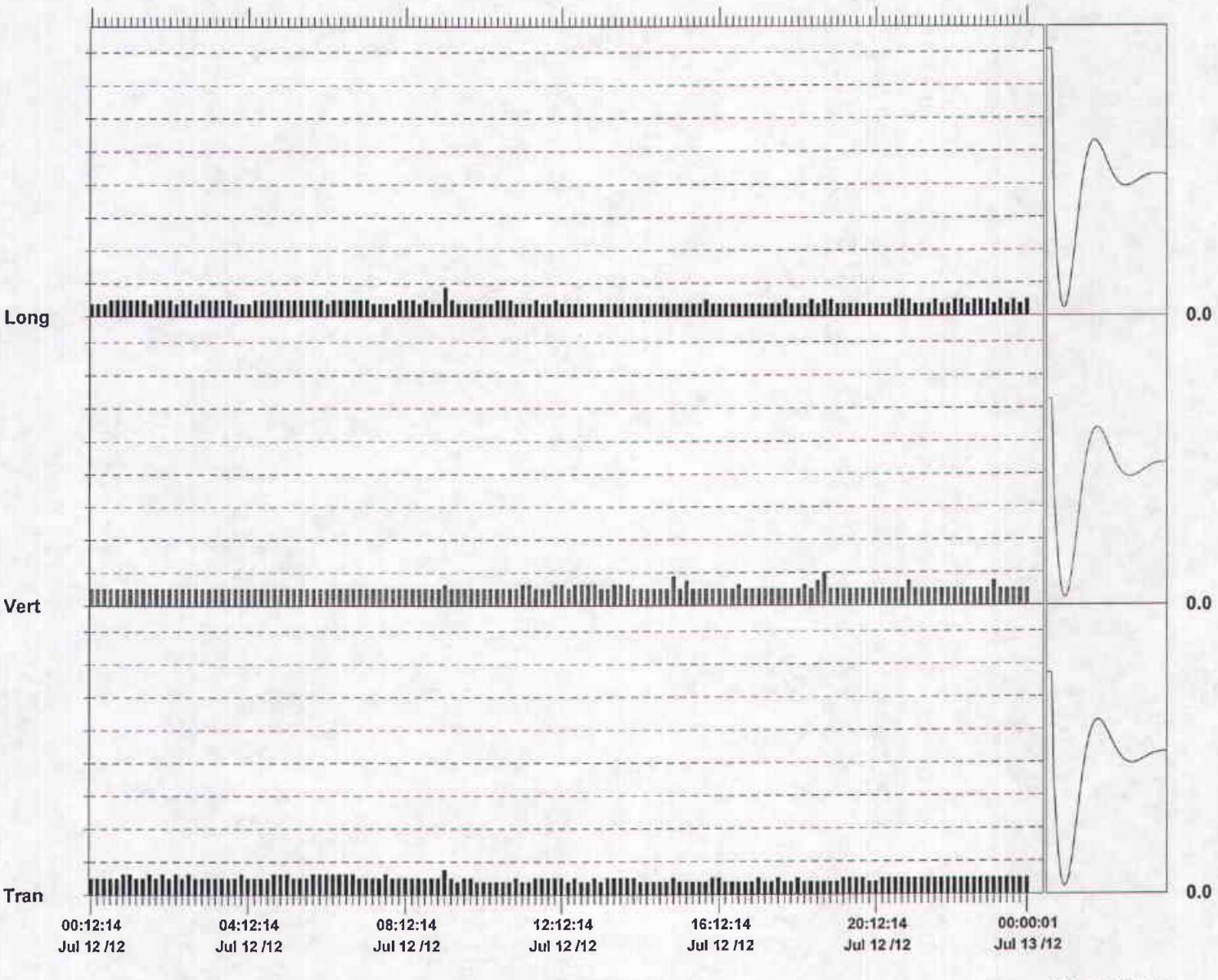
Histogram Start Time	00:02:14 July 12, 2012	**Serial Number**	BE12643 V 10.31-8.17 MiniMate Plus
Histogram Finish Time	00:00:01 July 13, 2012	**Battery Level**	6.6 Volts
Number of Intervals	1438 at 1 minute	**Unit Calibration**	June 21, 2012 by Instantel
Range	Geo:1.25 in/s	**File Name**	N643ED6I.RQ0H
Sample Rate	1024sps		
Job Number:	1210		

Notes
Location: Kennecott - Loc 5
Client: Kennecott
User Name: M. Feves (Earth Dynamics)
General: 35 Shaggy Mountain Dr., Herriman, UT

Extended Notes
Transducer BT1664

	Tran	Vert	Long	
PPV	0.00375	0.00500	0.00437	in/s
ZC Freq	>100	<1.0	>100	Hz
Date	Jul 12 /12	Jul 12 /12	Jul 12 /12	
Time	09:04:14	18:52:14	09:04:14	
Sensor Check	Passed	Passed	Passed	
Frequency	7.5	7.6	8.1	Hz
Overswing Ratio	3.9	3.5	3.8	

Peak Vector Sum 0.00515 in/s on July 12, 2012 at 18:52:14



Time Scale: 10 minutes /div **Amplitude Scale:** Geo: 0.00500 in/s/div

Sensor Check

Instantel Earth Dynamics Vibration Report

EARTH DYNAMICS
2284 NW Thurman St
Portland, OR 97210
(503) 227-7659
www.earthdyn.com

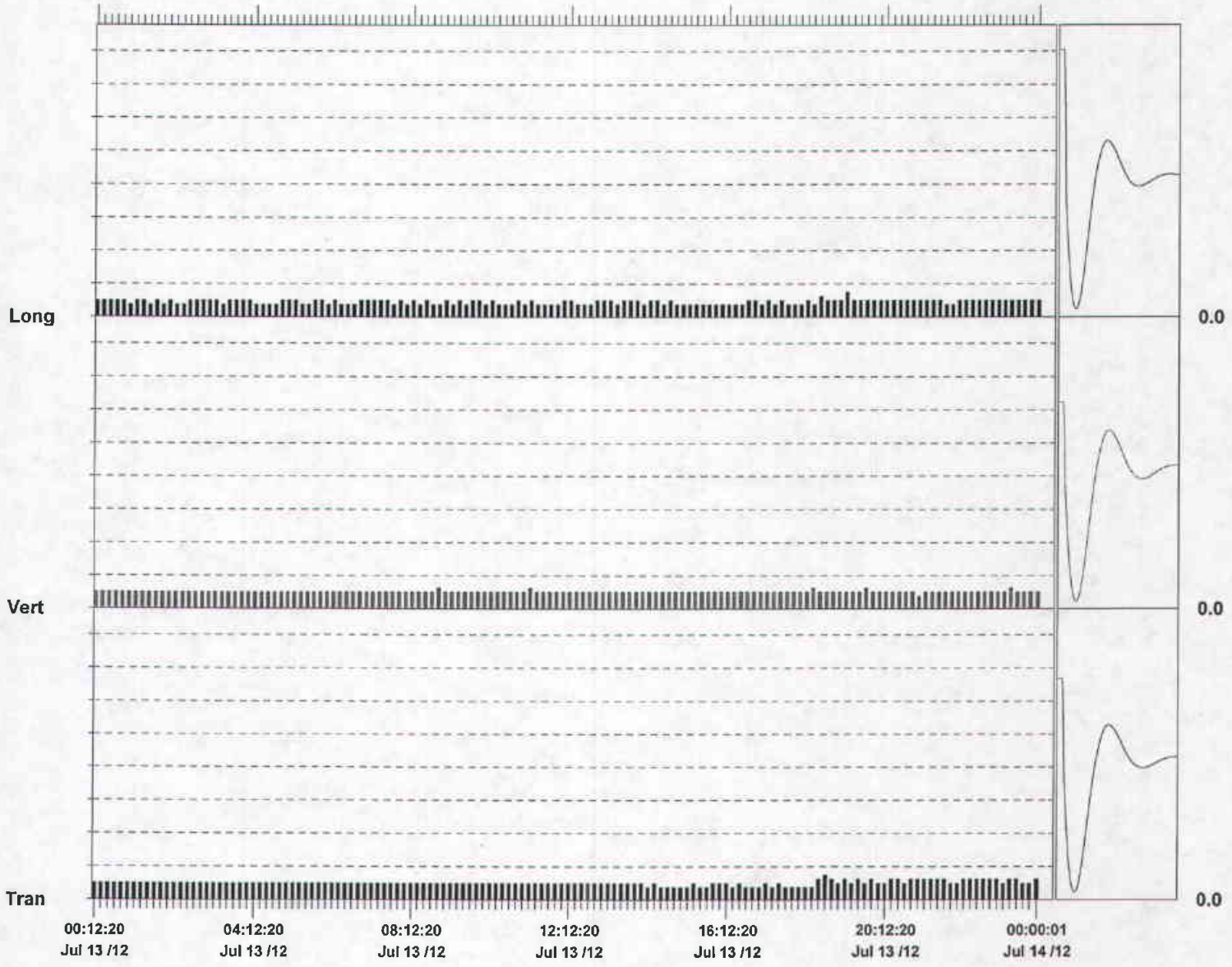
Histogram Start Time	00:02:20 July 13, 2012
Histogram Finish Time	00:00:01 July 14, 2012
Number of Intervals	1438 at 1 minute
Range	Geo:1.25 in/s
Sample Rate	1024sps
Job Number:	1210
Notes	
Location:	Kennecott - Loc 5
Client:	Kennecott
User Name:	M. Feves (Earth Dynamics)
General:	35 Shaggy Mountain Dr., Herriman, UT

Serial Number	BE12643 V 10.31-8.17 MiniMate Plus
Battery Level	6.7 Volts
Unit Calibration	June 21, 2012 by Instantel
File Name	N643ED8D.FW0H

Extended Notes
Transducer BT1664

	Tran	Vert	Long	
PPV	0.00375	0.00312	0.00375	in/s
ZC Freq	>100	8.3	>100	Hz
Date	Jul 13 /12	Jul 13 /12	Jul 13 /12	
Time	18:41:20	08:48:20	19:10:20	
Sensor Check	Passed	Passed	Passed	
Frequency	7.4	7.6	7.9	Hz
Overswing Ratio	3.9	3.6	3.8	

Peak Vector Sum 0.00400 in/s on July 13, 2012 at 18:59:20



Time Scale: 10 minutes /div **Amplitude Scale:** Geo: 0.00500 in/s/div

Sensor Check

Instantel Earth Dynamics Vibration Report

EARTH DYNAMICS
2284 NW Thurman St
Portland, OR 97210
(503) 227-7656
www.earthdyn.com

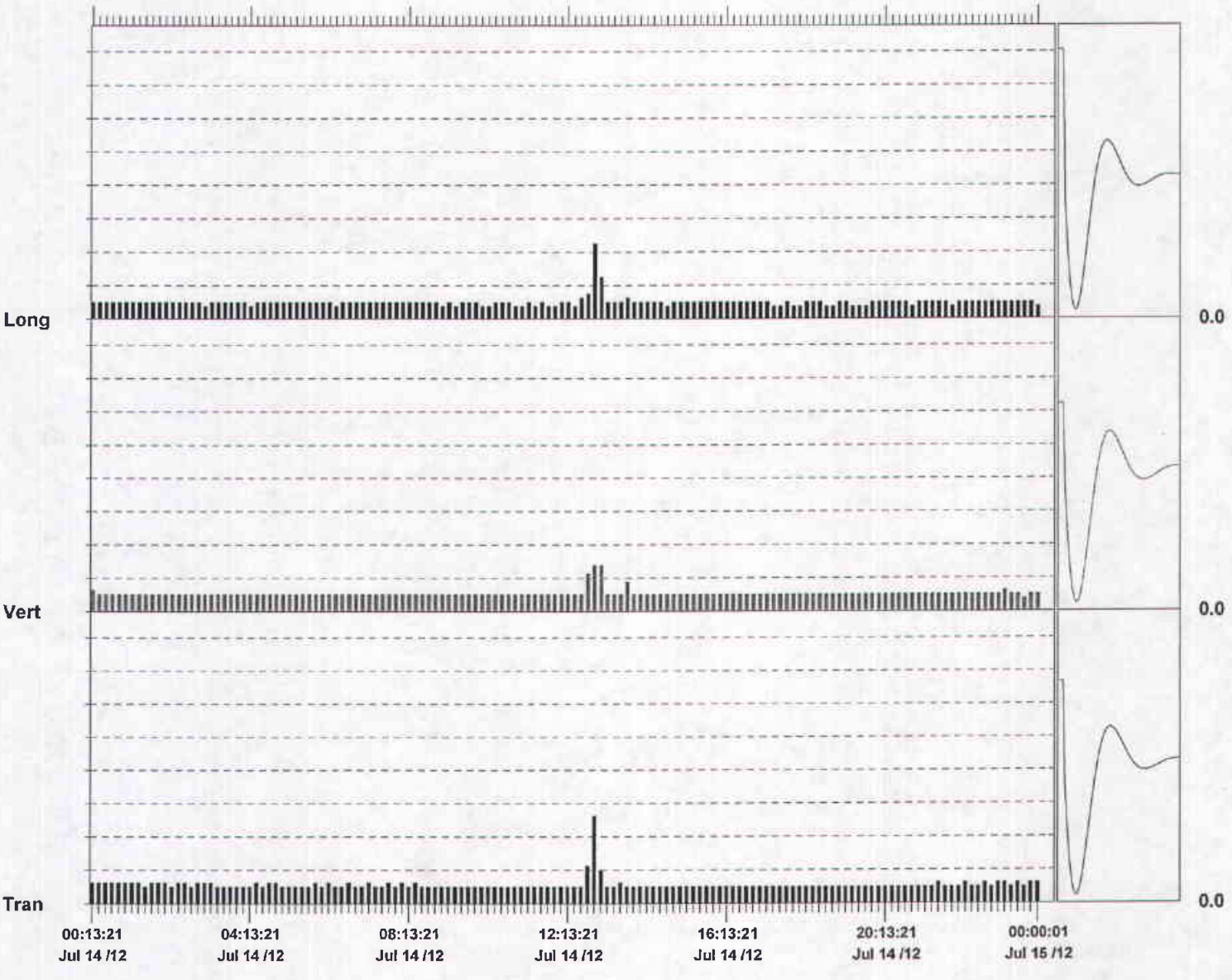
Histogram Start Time	00:03:21 July 14, 2012	**Serial Number**	BE12643 V 10.31-8.17 MiniMate Plus
Histogram Finish Time	00:00:01 July 15, 2012	**Battery Level**	6.7 Volts
Number of Intervals	1437 at 1 minute	**Unit Calibration**	June 21, 2012 by Instantel
Range	Geo:1.25 in/s	**File Name**	N643EDA8.5L0H
Sample Rate	1024sps		
Job Number:	1210		

Notes
Location: Kennecott - Loc 5
Client: Kennecott
User Name: M. Feves (Earth Dynamics)
General: 35 Shaggy Mountain Dr., Herriman, UT

Extended Notes
Transducer BT1664

	Tran	Vert	Long	
PPV	0.0131	0.00687	0.0112	in/s
ZC Freq	>100	>100	>100	Hz
Date	Jul 14 /12	Jul 14 /12	Jul 14 /12	
Time	12:46:21	12:49:21	12:50:21	
Sensor Check	Passed	Passed	Passed	
Frequency	7.4	7.5	7.9	Hz
Overswing Ratio	3.9	3.6	3.8	

Peak Vector Sum 0.0164 in/s on July 14, 2012 at 12:50:21



Time Scale: 10 minutes /div **Amplitude Scale:** Geo: 0.00500 in/s/div

Sensor Check